EFFECTIVENESS OF INSTALLATION AEROMEDICAL EVACUATION

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ABSTRACT

EFFECTIVENESS OF INSTALLATION AEROMEDICAL EVACUATION, by MAJ Lexie B. Buenaventura, 92 pages.

The Army faces the challenge of rebalancing priorities amid reduction of funding for the Global War on Terrorism while still maintaining effective aeromedical evacuation support for both garrison and operational missions. The central research question is whether the current system of aeromedical evacuation is effective in support of Army installations. Effectiveness was examined against three evaluation criteria: cost, integration, and control. Results showed effectiveness of installation aeromedical evacuation was assessed as less than desirable in cost and neutral in both integration and control mechanisms. Overall conclusions are the current system of aeromedical evacuation certainly completes the mission but is not efficient.

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ACRONYMS

ARNG	Army Reserve National Guard
CoE	Centers of Excellence
CONUS	Continental United States
DoD	Department of Defense
DSCA	Defense Support of Civil Authorities
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
FORSCOM	Forces Command
GSAB	General Support Aviation Battalion
HEMS	Helicopter Emergency Medical Service
IMCOM	Installation Management Command
MASCAL	Mass Casualty
MAST	Military Assistance to Safety and Traffic
MEDCEN	Medical Center
MEDCOM	Medical Command
MEDEVAC	Medical Evacuation
MTOE	Modified Table of Organization and Equipment
NTC	National Training Center
OTSG	Office of The Surgeon General
SOP	Standing Operating Procedures
TDA	Table of Distribution and Allowances
TRADOC	Training and Doctrine Command
USAAAD	US Army Air Ambulance Detachment

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CHAPTER 1

INTRODUCTION

Background

"When I have your wounded." The dying words of Major Charles L. Kelly, Father of "Dustoff," otherwise known as Army aeromedical evacuation, resonate with every medic and medically affiliated personnel across the United States Army. Medical evacuation (MEDEVAC) is movement in dedicated, standardized, air or ground, platforms with a professional medical attendant that provides enroute care to the wounded and sick during the transportation to an appropriate medical facility (Department of the Army 2007a, 1-7). The organized practice of evacuating wounded personnel has its roots in ground MEDEVAC in the Civil War with Major John Letterman, Medical Director of the Army of the Potomac (Dorland and Nanney 2008, 5). MEDEVAC expanded to the air domain in World War I with fixed-wing aircraft. While fixed-wing aircraft became more prevalent During World War II, rotary-wing helicopters remained in research and development (Dorland and Nanney 2008, 7-9). Helicopter ambulances became permanent Army organizations during the Korean War (Dorland and Nanney 2008, 19). However, combat commanders did not truly realize the critical benefits of air MEDEVAC until the Vietnam War. Under the vision of Major Charles Kelly, his unit made MEDEVAC famous for evacuating the wounded when others thought it was dangerously impossible (Dorland and Nanney 2008, 32-41).

Problem Context

Today the Army's air MEDEVAC units have perpetuated Major Kelly's legacy, contributing significantly to the over 95 percent total casualty survival rates in both Iraq and Afghanistan. The 11 September 2001 attacks substantially altered the air MEDEVAC units' dynamic mission sets. Prior to this date, Army air ambulance units provided MEDEVAC coverage to Army installations and participated in the program for Military Assistance to Safety and Traffic (MAST) within the continental United States under Department of Defense (DoD) Directive 4500.09E, *Transportation and Traffic Management*. MAST was the initiative where the Department of Defense provided Army MEDEVAC to civilian authorities in cases of medical emergencies beyond the capability of the requesting community (Department of Defense 2007, 9). Operational requirements and continuous deployments overwhelmed air MEDEVAC units soon after the attacks of 11 September 2001.Therefore, starting in 2005, Installation Management Command (IMCOM) used Overseas Contingency Operations and Global War on Terrorism funds to contract civilian support to cover installation air MEDEVAC where operational requirements exceeded Army air MEDEVAC capability.

However, with deployments decreasing and theaters downsizing, in the midst of the 2012 budget reviews through fiscal year 2015, IMCOM requested Forces Command (FORSCOM) reinstate air MEDEVAC units in conducting installation air MEDEVAC as they had been prior to 11 September 2001. FORSCOM acknowledged the requirement but abstained from providing support due to continuing deployment requirements. FORSCOM also cited it could not support installation air MEDEVAC with its current budget. Moreover, critical training and certification requirements, such as upgrading

flight medic skills from basic emergency medicine to paramedic, continue to dominate air MEDEVAC unit priorities while in reset (Clyde 2013).

Research Questions

The primary question of this thesis is "Is the current system of aeromedical evacuation effective in support of Army installations?" The subsequent questions are as follows:

1. What are the current differences, if any, between civilian contracted and military MEDEVAC services?

2. Who is the responsible proponent for installation MEDEVAC coverage – IMCOM, FORSCOM, Training and Doctrine Command (TRADOC), or Medical Command (MEDCOM)?

3. Should the responsible agent be IMCOM because it manages garrison services?

4. Should the responsible agent be FORSCOM because it is the Department of the Army's executive agent for continental United States unit mobilization, deployment, redeployment, demobilization, and reconstitution planning and execution, and can determine the mission cycles of the medical companies (air ambulance) under the control of the General Support Aviation Battalions?

5. Should the responsible agent be TRADOC because it oversees maintenance and sustainment training-base equipment to include helicopters?

6. Should the responsible agent be MEDCOM because it monitors and manages health services Army-wide?

Scope

This thesis will identify military air MEDEVAC requirements in relation to aviation qualifications, medical certifications, and control mechanisms. It will also evaluate the same requirements for civilian air MEDEVAC in order to analyze any differences. After defining MEDEVAC requirements, the criteria describing the need for MEDEVAC will be established. Finally, in order to assess effectiveness, this thesis will compare the current available capabilities to the current and potential future requirements in terms of cost, integration, and control mechanisms.

Limitations

This study includes only unclassified information and information not protected under the Health Insurance Portability and Accountability Act. Due to lack of access and uniform records documenting patient data, effectiveness will not be measured based on patient outcomes. Although it may eventually be possible to collect the necessary patient data, time constraints to request, compile, and analyze the information would not allow for completion of this study.

Delimitations

Delimitations of this study are that analysis of installation MEDEVAC is limited to the Army installations with Army air ambulance companies residing on the installation. The study is further limited to Army installations with existing contracts for civilian MEDEVAC support. Moreover, the focus of this thesis is on rotary-wing aeromedical evacuation. The use of helicopters normally signifies a sense of urgency prescribing immediate evacuation based on a patient’s condition and time available to

transport the patient, thereby limiting ground MEDEVAC alternatives. On the other hand, use of fixed wing aircraft normally implies simple patient transport; the patient is stable and less urgency exists. Patient transport is a more predictable event that can be scheduled or be done in a less rapid mode of transport whereas MEDEVAC requires an immediate response.

Significance of the Study

The purpose of this study is to analyze the effectiveness of the current installation MEDEVAC system. The effectiveness of Army air MEDEVAC is a current and relative topic that is also one of The Surgeon General's strategic issues that the Army MEDCOM staff is addressing (Clyde 2013). The underlying problem is fiscal constraints creating a need for balancing MEDEVAC requirements. The results can be used to improve processes and resource allocation (Army MEDEVAC and funds) against more clearly defined criteria for installation MEDEVAC coverage.

The significance of this study is in its application to both military and civilian aeromedical evacuation. Time and distance to the nearest appropriate medical facility is important, in both combat and garrison, for the survivability of the patient. Examination of the use of air MEDEVAC in rural versus urban environments in the civilian sector is similar to the examination of the use of air MEDEVAC in the miles of remote training areas and isolated garrisons. Furthermore, given the logistical and fiscal limitations of both the U.S. Army and civilian health care facilities, use of air MEDEVAC assets will not always be feasible or cost effective. Therefore, ways to mitigate mortality rates, through efficient processes and proper resource allocation based on established criteria, warrant comprehensive study. Moreover, in order for any system to function effectively,

that system must have a responsible agent. As homogenous as military structure may appear, uniformity is only as clear as the designated task organization and chain of command. Several different organizations residing on a military installation have special interest in understanding emergency procedures, such as air MEDEVAC. This is also true in the civilian community. Local, state, and federal governments have a stake in ensuring emergency medical services (EMS) function effectively. Hospitals that are not integrated into a regional medical system need to understand how and where to medically regulate patients to the appropriate facility by the most suitable means. There is no central command structure ensuring equity in location or allocation of resources like air MEDEVAC across the United States. This potentially affects the availability of these limited assets where needed most. Lastly, civilian air MEDEVAC originated from military air MEDEVAC; continued improvements in either civilian or military MEDEVAC may enhance both civilian and military communities.

In this chapter, the problem of installation MEDEVAC coverage and key areas of concern were identified. The next chapter will present the literature review on what has already been written on aeromedical evacuation.

CHAPTER 2

LITERATURE REVIEW

The primary question of this thesis is "Is the current system of aeromedical evacuation effective in support of Army installations?" Analyzing the effectiveness of aeromedical evacuation is one of the Office of The Surgeon General's strategic issues (Clyde 2013). In this chapter, five main areas of interest were researched: the genesis of MEDEVAC, demand for aeromedical evacuation, aeromedical pilot qualifications, medical crew qualifications, and MEDEVAC control mechanisms. In contemplation of these five areas, the question to deliberate is whether the current system of aeromedical evacuation is effective in its support of Army installations.

Genesis of MEDEVAC

The first area of interest in researching this thesis is the history of medical evacuation. Military air MEDEVAC is a relatively young capability. Its roots reach as far back as the Civil War ground MEDEVAC system. Air MEDEVAC originated in World War I with fixed-wing aircraft, was further developed with rotary-wing aircraft in World War II, and gained organization and structure in the Korean War. Under the leadership of Major Charles Kelley during the Vietnam War, air MEDEVAC flourished into the effective air MEDEVAC system of today. *Call Sign–Dustoff: A History of U.S. Army Aeromedical Evacuation from Conception to Hurricane Katrina* provided a comprehensive history of Army aeromedical evacuation (Whitcomb 2011, 1-351).

Civilian MEDEVAC, highlighted in EMS, is also a relatively young capability. It originated from the established military MEDEVAC systems. Military MEDEVAC

processes in combat were considerably more refined than military MEDEVAC processes in garrison. Similar to civilian MEDEVAC, variations in demand and use across medical levels of care and locations made military MEDEVAC processes more diverse outside of the combat environment.

"International EMS Systems: The United States: Past, Present, and Future," an article from the interdisciplinary clinical and science journal, *Resuscitation*, provided a succinct history of EMS in the United States (Pozner et al. 2003, 239-243). Just as the Army system for MEDEVAC evolved from Letterman's organization and practices, civilian EMS in Cincinnati and New York City evolved from Letterman's example (Pozner et al. 2003, 240). Furthermore, while World Wars I and II introduced aircraft into the military evacuation system, the civilian sector focused instead on medical treatment and introduced the first Emergency Medical Technician training program. This model continued to evolve into a distinct advanced care model through the time of the Vietnam War. In 1966, the Highway Safety Act formally established EMS under the U.S. Department of Transportation.

Equally important, "Evolution of Civil Aeromedical Helicopter Aviation" discussed the history of civilian air MEDEVAC (Meier and Samper 1989, 885-891). Once again, the U.S. Army's MEDEVAC system became the example the civilian sector emulated. With battlefield mortality decreased to less than 2 percent in Vietnam, the National Research Council of the National Academy of Sciences used those observations for comparison in an analysis of U.S. highway safety standards. Their recommendations for improvement to the civilian system incorporated helicopter ambulances as a mitigation to deploy medical care to, or evacuate casualties from, remote areas to

regional hospitals. This employment of air MEDEVAC in the civilian sector became what is now a functional component of EMS (Meier and Samper 1989, 889).

Understanding the history of MEDEVAC is equally important as analyzing the functions of MEDEVAC. According to the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) pamphlet on “How to Plan for Workplace Emergencies and Evacuation,” specific companies addressed under Code of Federal Regulation 1910.38 are required to have emergency action and fire prevention plans (Department of Labor 2001, 11). Those companies are not specifically identified as any one type of organization. Instead, the establishment of an Emergency Action Plan is required by any organization required to comply with other federal regulations. These regulations dictate the use of fire extinguishers or fire suppression systems and handling of hazardous materials, hazardous waste, or operation of grain facilities. Emergency response includes medical treatment and transportation under 29 Code of Federal Regulations 1910 and 1926 (Department of Labor 2004, 5, 14, 50).

The DoD issued Department of Defense Instruction 6055.06 on the DoD Fire and Emergency Services Program. This instruction established the fire and emergency program to prevent loss of life and damage to property. It also made allowances for the military to assist civil authorities with emergency services under prearranged agreements (Department of Defense 2006, 2). Furthermore, Department of Defense Directive 5100.01, *Functions of the Department of Defense and Its Major Components*, reissued in December 2010, specifically tasked the Army to “provide intra-theater aeromedical evacuation.” It concurrently tasked the Air Force to “provide global mobility . . . assets for aeromedical evacuation” (Department of Defense 2010, 30).

Army Regulation 40-3, *Medical, Dental, and Veterinary Care,* specified, "the Medical Evacuation System consists of ground and air medical evacuation platforms which work in concert to clear the battlefield" (Department of the Army 2010, 57). However, the regulation does not specify the criteria for need or use of ambulances in garrison. Authorizations for use of medical equipment and platforms are only specified as "in accordance with" the table of distribution and allowances (TDA), modified table of organization and equipment (TOE), and Department of the Army special authorization documents (Department of the Army 2010, 57).

Given the limited numbers of Army MEDEVAC units and aircraft, missions gravitated towards their use in the battlefield environment. According to an unpublished Installation MEDEVAC brief dated 14 May 2012, there are 42 MEDEVAC units; however, an additional unit was activated on 3 April 2013, bringing the total to 43 MEDEVAC units (Swartz 2012). Of these 43 MEDEVAC units, 19 are Active Component, 21 are National Guard, and three are Reserve units. Of the 19 Active Component units, four are dedicated support to the major training centers at Fort Irwin, Fort Polk, Yakima, and Fort Rucker. From a separate brief, "MEDEVAC Enterprise," dated 25 March 2013, of the remaining 15 Active Component units, two are based in Germany, one in Korea, one in Honduras, one in Hawaii, and one in Alaska; nine are based in the continental United States (Borowski 2013a). The 15 Active Component MEDEVAC units currently serve 12 months deployed for every 14 months at home station. The need for dedicated MEDEVAC on the battlefield is highlighted in the recent study, "Analyzing the Future of Army Aeromedical Evacuation Units and Equipment: A Mixed Methods, Requirements-Based Approach" (Bastian et al. 2013, 321-328).

Demand for Aeromedical Evacuation

The second area of interest in researching this thesis is establishing the criteria for using aeromedical evacuation. “Aeromedical Emergency Trauma Services and Mortality Reduction in Rural Areas,” published in the *New York State Journal of Medicine*, was notably pertinent to defining the demand for aeromedical evacuation. This article addressed the factors influencing the effectiveness of air MEDEVAC on the different categories of patients and provided a cursory estimate of cost for ambulance services (Freilich and Spiegel 1990, 359-361). Patient categories were determined by using the Trauma Score (TS) and the Injury Severity Score (ISS). TS assessed cardiovascular, respiratory, and central nervous system functions. Lower scores indicated increased rates for mortality. ISS calculated the three most critically injured areas of the body, and lower scores indicated major trauma. What Freilich and Spiegel found was that geographic factors and inadequate medical care resulted in poor prognosis of rural trauma patients, and the most critical point in patient survival was the initial immediate care (Freilich and Spiegel 1990, 360-1). Dr. Ronald Bellamy established the same conclusion concerning soldier casualties in his chapter on combat trauma in the Borden Institute’s *Anesthesia and Perioperative Care of the Combat Casualty* (Bellamy 1995, 16-17). Care rendered to trauma patients within the “Golden Hour” had reduced mortality rates in comparison to patients who were rapidly evacuated without immediate medical care. Freilich and Spiegel underscored the value of aeromedical evacuation in rapid transport of rural patients to the nearest trauma center or rapid delivery of medical teams to the trauma patient (Freilich and Speigel 1990, 361). They identified geography and transport time,

patient level of consciousness, and injury severity as the most effective determinations for deciding optimal patient transport means.

“Optimization of Ambulance Services at McDonald Army Community Hospital,” a U.S. Army-Baylor University Graduate Program in Health Care Administration thesis for residency completion described the effectiveness of ground ambulance services on Fort Eustis. (Sheridan 2005, 24-43). In the case study introduction, it described the ambulance services required on Fort Eustis and in the surrounding communities of Fort Pickett, Fort Monroe, and Fort Story (Sheridan 2005, 2). Even at this local level, the complexity of requirements and solutions were addressed as diversely as at the CONUS level. Medical evacuation means ranged in coverage from organic ambulances and hospital personnel, contractors and leased ambulances, and a fee for service agreement with a local fire department. The impetus for MEDEVAC analysis stemmed from resource constraints. Interestingly, the study found the density of ambulances within the state of Virginia exceeded all other states, (Sheridan 2005, 25) but the cost of contracted ambulances was higher than TRICARE maximum allowable charges (Sheridan 2005, 30). Evacuation provided by the hospital was assessed as an effective system; however, the installation fire department owned the majority of the ambulances yet completed proportionately fewer of the evacuation missions (Sheridan 2005, 45).

Concerning asset allocation and associated costs, the article, “Ambulance Economics,” from the *Journal of Public Health Medicine*, analyzed British ground ambulance services over the course of four years in order to define optimal ambulance numbers and launch criteria (Fischer et al. 2000, 415-417). The article framed cost in terms of formulas for optimizing and meeting target response times. “Medical Evacuation

and Treatment Capabilities Optimization Model," a Naval Postgraduate School thesis for a Master of Science in Operations Research, similarly examined medical resource requirements and efficient allocation of naval medical evacuation and treatment assets (Bouma 2005, 32-41). Although this analysis applied to the deployed environment, it provided an objective formulary, evaluated against pre-established measures of effectiveness, for designing an optimal mix of medical capabilities.

Lastly, but most importantly, the demand for aeromedical evacuation was best analyzed and described in an unpublished 2002 MEDEVAC study directed by the Army G-3 under the Aviation Transformation Initiative. The study determined and prioritized which CONUS areas required Army MEDEVAC coverage based on major Army command recommendations and mission requirements (Anderson 2002, 21-25).

MEDEVAC Pilot Qualifications

The third area of interest in researching this thesis is establishing the credentials and training necessary for a MEDEVAC pilot. Army Regulation 95-1, *Flight Regulations*, established Army pilot qualification, training, and evaluations standards and recognized the Federal Aviation Administration provisions and Title 14 Code of Federal Regulations, the same standards mandated for civilian pilots (Department of the Army 2008, 3). Training Circular 3-04.11, *Commander's Aircrew Training Program for Individual, Crew, and Collective Training*, provided the actual aircrew training requirements and description of training readiness levels (Department of the Army 2009a, 3-1 to 3-13). Additionally, Training Circular 1-237, *Aircrew Training Manual Utility Helicopter H-60 Series,* provided the evaluation procedures specific to the Black Hawk, the aircraft typically used for Army MEDEVAC (Department of the Army 2007b, 3-1 to

3-8). Similar manuals for the LUH-72 Lakota were not located in current circulation for Army publications. The Lakota is the MEDEVAC aircraft prevalent at the major training centers and some Army Reserve and National Guard MEDEVAC units. Refer to Appendix A, Military MEDEVAC Aircraft Capabilities for a technical description. The Lakota is similar in size and capability to the common traditional commercial MEDEVAC helicopters. Refer to Appendix B, Commercial MEDEVAC Aircraft Capabilities.

The "CONUS Installation Medical Evacuation (MEDEVAC) Analysis," the 2002 study conducted by the Office of the Surgeon General, laid out the primary differences between civilian and military air ambulance services. Military air ambulance protocols allow MEDEVAC units to fly in inclement weather that would prevent civilian equivalents. Additionally, civilian air ambulances services normally do not have proficiency or capability in use of night vision goggles or rescue hoist operations (Anderson 2002, 8-9). All skills are necessary in combat environments.

In the 2002 Air Medical Physician Association report, "A Safety Review and Risk Assessment in Air Medical Transport," 49 percent of civilian helicopter EMS accidents occurred during night operations despite night flights constituting an average of 38 percent of flights (Blumen and UCAN Safety Committee 2002, 5). Furthermore, weather influenced 32 percent of accidents, and pilot error contributed both directly and indirectly to up to 76 percent of accidents (Blumen and UCAN Safety Committee 2002, 6-12).

"Military and Civilian Emergency Aeromedical Services: Common Goals and Different Approaches," an article published in the *Army Medical Department Journal* but originally published in the *Aviation, Space, and Environmental Medicine* magazine,

examined the differences between military air MEDEVAC programs and civilian air MEDEVAC in terms of aviation safety and medical care standards (De Lorenzo 1997, 9-15). This article was the most comprehensive and relevant piece of literature highlighting differences in crew composition, equipment, and training as well as providing a cursory example of cost.

Medical Crew Qualification

The fourth area of interest in researching this thesis is establishing the credentials and training required to effectively deliver flight medical care. The *Soldier's Manual and Trainer's Guide MOS 68W Health Care Specialist Skill Levels 1/2/3* provides the detailed critical task list, conditions, and standards a medic is required to perform (Department of the Army 2013, 2-3 to 2-10). Furthermore, the *Medical Education and Demonstration of Individual Competence (MEDIC)* is the Army's annual critical skills proficiency test for verification of medical skills (Department of the Army 2009c, 2-3 to 2-7). Additionally, *Aeromedical Training for Flight Personnel* covers essential medical skills in the aviation environment (Department of the Army 2009b, 2-1 to 10-7). Both Army medic and Army flight medic are required to pass the civilian National Registry of Emergency Medical Technicians (NREMT) exam in order to certify as health care specialists (Department of the Army EMS). The comprehensive list of NREMT certification requirements for EMT-Basic is the base requirement for Army ground and flight medics. The scope of practice for both the civilian and military medic is emergency medical care, specifically trauma skills, and transportation for critical patients (National Highway Traffic Safety Administration 2007, 23).

"U.S. Army Air Ambulance Operations in El Paso, Texas: A Descriptive Study and System Review" specifically analyzed the need for military air MEDEVAC in the context of MAST and compared medical, aviation, and equipment capability to civilian air MEDEVAC (Gerhardt et al. 2001b, 102-107). Dr. Robert Gerhardt and his co-authors found the civilian medical aircrew training standards and medical equipment exceeded that of Army air ambulance units (Gerhardt et al. 2001b, 105). "U.S. Army MEDEVAC in the New Millennium: A Medical Perspective," an article written for *Aviation, Space, and Environmental Medicine*, best described the need for air MEDEVAC in garrison. Dr. Gerhardt and his co-authors reiterated the limitations of Army air ambulance units and described the medical standards required to be comparable to current civilian air medical transport systems (Gerhardt et al 2001a, 661). The authors also postulated on whether air MEDEVAC existed only as a means to clear casualties from a battlefield, as it is being used now, or whether it should be considered a viable EMS asset, as it was used in the MAST program (Gerhardt et al. 2001a, 659).

"Sharpening the Edge: Paramedic Training for Flight Medics," an article from the *Army Medical Department Journal*, specifically discussed the differences between military and civilian in-flight medical care. It further discussed the cost for educational requirements needed to bring military flight medic standards up to civilian paramedic standards (Mabry and De Lorenzo 2011, 92-98). The article mentioned earlier, "U.S. Army MEDEVAC in the New Millennium: A Medical Perspective," also discussed the differences in medical care requirements between the military and civilian systems (Gerhardt et al. 2001a, 659-661).

Command and Control of MEDEVAC

The final area of interest in researching this thesis is control mechanisms to ensure appropriate support. Army Regulation 95-1, *Flight Regulations*, specified the installation or senior mission commander establish procedures for mission acceptance and launch authority (Department of the Army 2008, 11). “A New Technique Enables Dynamic Replanning and Rescheduling of Aeromedical Evacuation” highlighted the 1993 Department of Defense initiative to oversee medical evacuation and regulation. At the strategic level, DoD designated the U.S. Transportation Command as the executive agent and developed the Transportation Command Regulating and Command and Control Evacuation System use for worldwide tracking of patient movements (Kott, Saks, and Mercer 1998, 1-3). Although MEDEVAC at the strategic level is not time-sensitive or directly related to EMS, it provided an example of an identified responsible agent and a viable system for managing requirements. This is somewhat similar to what could improve the overall 9-1-1 system for EMS communications.

A few articles that were not directly applicable to medical evacuation were examined for indirect applications. “Modelling Production and Cost Efficiency within Health Care Systems” is a brief introduction into the cost of, access to, and quality of health care based on papers presented at a health conference (Tavakoli, Davies, and Malek 1999, 59-60). “A Framework for Operational Modelling of Hospital Resources” is a similar article in its approach, but it goes further in providing statistical analysis and algorithms for improving health care management (Harper 2002, 165-173). Neither is considered applicable to evaluating medical evacuation system effectiveness; however,

they provide some insight into factors driving health care costs and defining requirements.

The Aviation Transformation Initiative between 2003 and 2005 fractured control of Army MEDEVAC between aviation and medical authorities (Whitcomb 2011, 308-321). The Army moved the air ambulance companies from the Army Medical Department's medical evacuation battalions to general support aviation battalions in 2003. This move changed proponency of aeromedical evacuation companies from medical to aviation. The reorganization was designed to "improve capabilities, flexibility, maintenance, safety, standardization, airspace management, and resourcing" (Whitcomb 2011, 313). However, the air ambulance companies retained the Standard Requirements Code of 08 (Medical) in order "to maintain medical command and control" (Whitcomb 2011, 314) and for OTSG "to maintain visibility of the readiness of . . . medical units" (Whitcomb 2011, 318).

The next chapter will discuss the research methodology used in assessing the effectiveness of current aeromedical evacuation support to Army installations.

CHAPTER 3

RESEARCH METHODOLOGY

The purpose of this study is to answer the primary question of this thesis: Is the current system of aeromedical evacuation effective in support of Army installations? The results can be used to improve processes and allocation of assets against clearly defined requirements for installation MEDEVAC. Several research methodologies will be employed, and information collected from existing literature and subject matter experts will be used to analyze the effectiveness of providing installation MEDEVAC in light of fiscal constraints.

First, a literature review will be conducted in order to establish a solid background of the military and civilian systems for medical evacuation. Areas of study will be the history of MEDEVAC, criteria for MEDEVAC, pilot qualifications, medic qualifications, and control of MEDEVAC. Particular attention will be focused on case studies that have examined medical evacuation systems in simple, localized systems in an attempt to identify and isolate the variables affecting effectiveness.

Anticipating the literature pertinent to analyzing effectiveness of installation MEDEVAC will be limited, informal interviews, in the form of email and phone conversations, will be conducted. Key stakeholders and subject matter experts in medical evacuation and treatment, installation services, and helicopter operations will be the target groups. These will include members of the Army Medical Department Center and School, the Medical Evacuation Proponency Directorate, the Office of The Surgeon General, Department of the Army G3/5/7 Aviation, and MEDEVAC Command Teams.

This will also include members of installation Range Control and EMS and civilian medical facilities.

Evaluation Criteria

The criteria for evaluating the effectiveness of aeromedical evacuation in support of Army installations will focus on cost, integration, and control mechanisms. Cost was chosen due to the imminent impact of fiscal constraints. Integration was examined due to the need for being able to accomplish versatile mission sets. Lastly, control mechanisms were looked at to analyze the processes behind the implementation of air MEDEVAC.

The first measure of effectiveness concerns cost. Cost is defined as the value, measured in dollars, of services rendered relative to the number of patients transported and the specified number of days of services. Aviation safety statistics are included in cost consideration.

The second measure of effectiveness concerns integration. Integration is defined in three parts. First, it is an analysis of time over distance to the nearest Level I or II trauma center. The “Golden Hour” is known as the optimal time to render medical treatment and evacuation in order to prevent the loss of life, limb, or eyesight, or to prevent death from traumatic injury or illness. The total time it takes from time of injury to reach the patient, render initial care, and evacuate includes the time it takes for an aircraft to launch. Fifteen minutes is the normal amount of time allocated for aircraft preparation prior to launch. Additionally, it is assumed ground MEDEVAC is less costly than air MEDEVAC when ground MEDEVAC is both available and meets the golden hour timeline. Ideally, any mission where ground MEDEVAC takes more than 30 minutes one-way to reach a patient, MEDEVAC aircraft should transport the patient.

Table 1. Evaluation Criteria		
Criteria 1. Cost Value of services are equitable to amount paid measured in dollars Number of missions or patients transported in comparison to time service is available Aviation safety maximized		
Less than Desirable	Neutral	Optimal
- Reasonable availability of services with fixed pricing - Rare use of MEDEVAC - Additional burden of cost for maintenance or fuel	- Substantial assurance of available services to match real-time requirements at lowest reasonable cost - Occasional use of MEDEVAC - Meets safety standards	- Dedicated aircraft - Significant use of MEDEVAC - History of consistently exceeding safety standards
Criteria 2. Integration Proximity to Level I or II trauma center measured by time-distance Availability for Homeland Defense and Homeland Security (DSCA) missions		
Less than Desirable	Neutral	Optimal
- Capability provided in a time frame consistent with patient needs - Reasonable availability in accordance with proposed schedule for DSCA missions	- Coordinated medical support agreement with receiving facility - Substantial assurance of MEDEVAC support within desired time period for DSCA missions	- Integration with military and civilian health system - MEDEVAC positioned to provide local and regional support for DSCA missions
Criteria 3. Control Mechanisms Centralized point of contact for receipt of mission, provision of aviation information Medical oversight in determination of mission priority Medical regulation of patients Seamless transition to next higher level of care		
Less than Desirable	Neutral	Optimal
- Centralized point of contact without medical oversight - Medical regulation by first responder	- Centralized point of contact includes medical oversight - Medical regulation by first responder	- Centralized point of contact with medical oversight - Medical regulation through coordinated communication with regional medical system

Source: Created by author.

The last measure of effectiveness concerns control. Control is defined in terms of establishing a centralized point of contact in order to process a mission request through completion. Control is also concerned with visibility of aircraft in flight and the ability to provide guidance or warnings appropriate with air traffic control. Included in the process is medical oversight to ensure medical regulation to the next appropriate level of care and a timely response for the receiving facility.

Threats to Internal Validity

A critical disclosure of this research study is the potential threats to internal validity based on selection bias. The installations examined were not random samples. The installations that were chosen for examination were ones with a resident Army air ambulance company and ones with a civilian MEDEVAC agreement in place. Only installations within the United States, mostly CONUS, were examined. These installations are all Army installations with deployable units and units that conduct high-risk training. Parts of these installations have significant remote areas to conduct training, and these areas are normally not in close proximity to medical care. Other characteristics of these installations, such as weather and elevation, can compound the difficulties for aeromedical evacuation, which may have been influential factors in the cost for MEDEVAC services.

A second threat to internal validity is based on the effects of history. The years examined ranged from the beginning of combat operations for the Global War on Terrorism to the heights of military deployments termed "the surge," and to the incremental drawdown of forces both from deployment and from total force structure. The expansion in operations stimulated an increase in funding and greater tolerance for

spending. This availability of funds may have allowed more missions to take place rather than more missions took place and therefore cost more money. An increase in deployments and missions parallel the current increase in Army MEDEVAC pilot experience. Pilots have more experience now than prior to combat operations. Some have separated from the military and augmented civilian aviation services. The level of experience in the current population of veteran pilots in both the military and civilian sectors may decline in subsequent years as the deployments decrease and the military restructures and provides less opportunity for flight operations.

The next chapter will present the results from the data gathered using the above evaluation criteria of cost, integration, and MEDEVAC control.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

This chapter will present the findings of the research, categorized by the evaluation criteria set in the previous chapter, in order to answer the primary question of this thesis: Is the current system of aeromedical evacuation effective in support of Army installations?

Cost

Cost is the value and availability of services rendered in comparison to the price in terms of money, missions or patients flown, and aviation safety statistics. Table 2 lists the summary of the current air MEDEVAC agreements for each installation and include the projected budget for 2015.

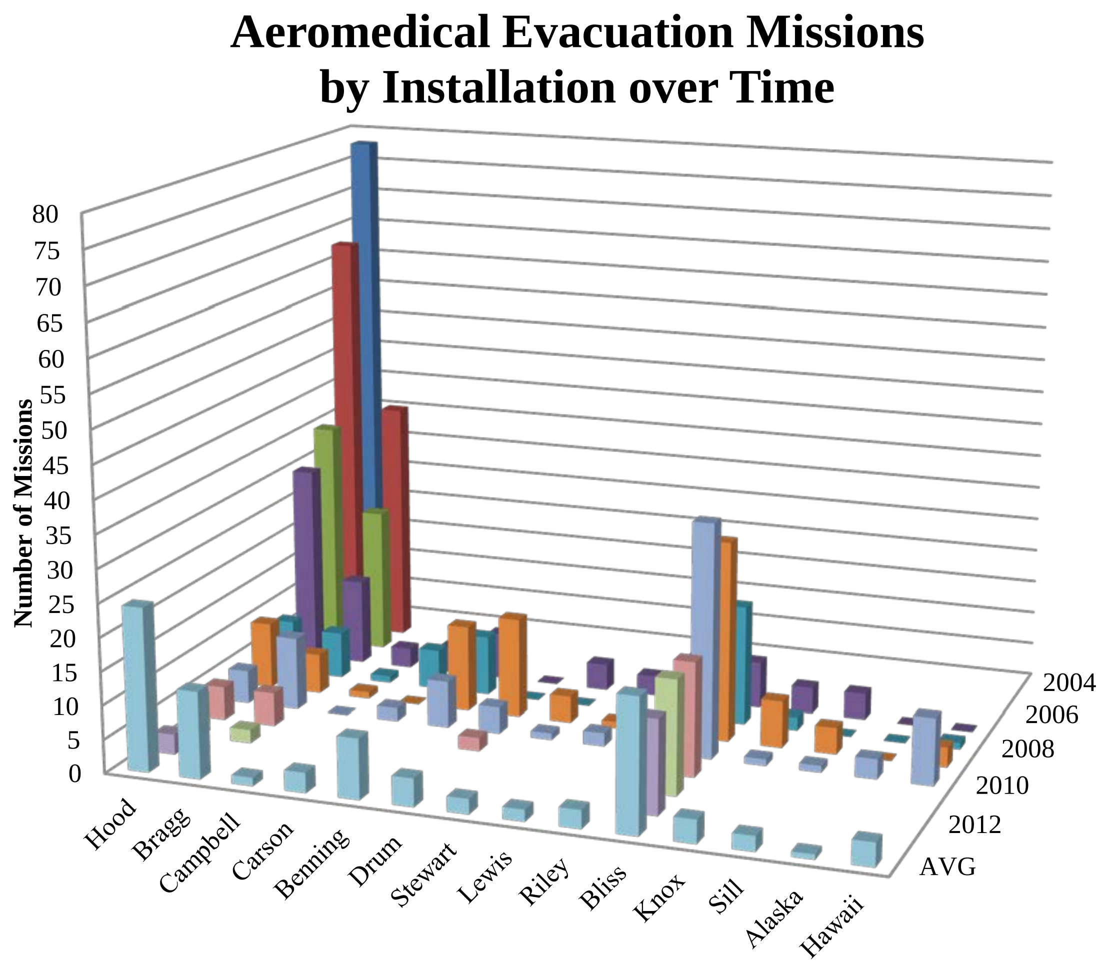
The 2002 OTSG MEDEVAC Study prioritized 18 CONUS installations for their need for aeromedical evacuation. This was based on 10 weighted criteria: (1) evacuation mission history, (2) urgency of missions, (3) frequency of urgent missions, (4) number of urgent mission peaks, (5) population at risk, (6) size of coverage area, (7) predominance of high risk training, (8) presence of active divisional units, (9) availability of civilian air and ground evacuation services, and (10) sustainability of MEDEVAC support (Anderson 2002, 17-19). Based on the above criteria, CONUS installations were prioritized as follows: (1) Fort Hood, (2) Fort Bragg, (3) Fort Campbell, (4) Fort Irwin, (5) Fort Polk, (6) Fort Carson, (7) Fort Benning, (8) Fort Drum, (9) Fort Rucker, and (10) Fort Stewart (Anderson 2002, 24-25).

Table 2. Air MEDEVAC Agreements

Installation	Agreement	Company and Contract #	FY15 Budget
Fort Wainwright	Contract	Evergreen Helicopters, Inc W912CZ08D0006	$10,655,493
USAG Hawaii	Contract	Evergreen Helicopters, Inc W912CN08D0013	$10,655,493
Fort Bliss	Contract	Air Methods Corporation W911SG12C0002	$6,784,906
Fort Drum	Fee for Service changed to Contract	Air Methods Corporation W911S212C3003	$5,512,140
Fort Hunter-Liggett Camp Roberts	Fee for Service	Mercy Air Air Methods Corporation	$3,090,093
Fort Benning	Contract	Air Methods Corporation W911SF10C0004	$2,811,344
Fort Hood	Fee for Service		$543,429
Camp Shelby	Fee for Service		$293,026
Fort Stewart	Fee for Service		$217,372
Fort Campbell	Fee for Service BPA	Vanderbilt Lifeflight Air Methods Corporation W9124805A0034	$179,012
Fort Bragg	Fee for Service	University of North Carolina	$135,325
Lewis-McChord	Fee for Service		$108,865
Fort Carson	Fee for Service	Colorado Flight for Life Air Methods Corporation	$64,998
Fort Knox	Fee for Service	Elizabethtown/Glasgow	$64,998
Fort Sill	Fee for Service	Mediflight of Oklahoma, Air Evac LifeTeam Air Methods Corporation	$64,998
Fort Riley	Fee for Service BPA	Topeka Air Ambulance	$22,376
Aviation Center of Excellence	TDA	USAAAD Rucker	8x UH-72
Joint Readiness Training Center	TDA	USAAAD Polk	8x UH-72
Yakima Training Center	TDA	USAAAD Yakima	8x UH-72
National Training Center	TDA	USAAA Irwin	6x UH-72

Source: Created by author using data from Lieutenant Colonel Michael F. Breslin, email brief to author "MEDEVAC Final" 5 April 2013; data from FMS Web https://fmsweb.army.mil/ (accessed 17 November 2013).

The study also found the installations with TDA MEDEVAC units (Forts Irwin, Polk, Rucker, and Yakima) flew 39 percent more missions than TOE units (Anderson 2002, 20). The National Training Center at Fort Irwin and the Joint Readiness Training Center at Fort Polk have unique missions in that they host high risk training consistently and on a rotational basis. This training can also increase the population at risk, adding brigades numbering between 3,000 and 10,000 people participating in training. This typically results in higher numbers of missions, urgency of missions, and frequency of urgent missions. Additionally, both installations are outside of a 20-minute response time for both civilian and air ground evacuation services. The U.S. Army Aviation Center of Excellence at Fort Rucker has similar circumstances to Forts Irwin and Polk in that they also have unique mission in hosting high-risk aviation training consistently and on a rotational basis. U.S. Army Air Ambulance Detachment (USAAAD) Rucker also provides air MEDEVAC support to the 5th Ranger Training Battalion at Dahlonega, GA, for 40 weeks annually and provides civil support to southern Alabama, western Georgia, and northern Florida (Alexander 2013). USAAAD Yakima is similar to USAAAD Rucker in its extended support to Joint Base Lewis McChord; National Guard, Canadian, British, and Japanese forces training at Yakima; and civil support for the Washington State Emergency Response Center requests (Borowski 2013b).



	Hood	Bragg	Campbell	Carson	Benning	Drum	Stewart	Lewis	Riley	Bliss	Knox	Sill	Alaska	Hawaii
2004	78													
2005	63	37												
2006	35	22												
2007	30	13	3	4	7	0	4	3	7	7	4	4	0	0
2008	8	7	1	6	9	0	0	1	1	18	2	0	0	1
2009	10	6	1	0	13	15	4	1	1	30	7	4	0	3
2010	5	11	0	2	7	4	1	2	2	35	1	1	3	10
2011	5	5				2				17				
2012	6	2								17				
2013	3									14				

Figure 1. Aeromedical Evacuation Mission Summary by Installation

Source: Created by author using data from email correspondence.

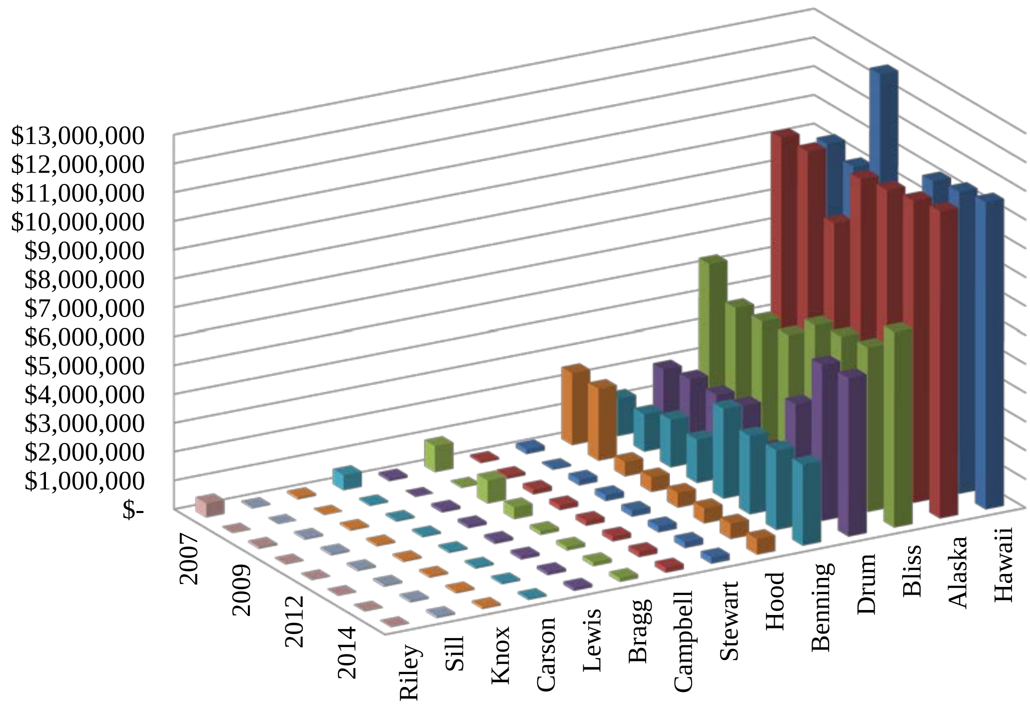
The prioritized ranking without those installations resulted in the following list: (1) Fort Hood, (2) Fort Bragg, (3) Fort Campbell, (4) Fort Carson, (5) Fort Benning, (6) Fort Drum, (7) Fort Stewart, (8) Fort Lewis, (9) Fort Riley, and (10) Fort Bliss. Of this list, only three installations, Fort Bliss, Fort Drum, and Fort Benning, are currently under civilian MEDEVAC contract. Fort Hood was once under civilian MEDEVAC contract, but the contract was not renewed because it was not cost-effective (Reed 2013). All other installations have established agreements with commercial companies on a fee-for-service basis. MEDEVAC coverage is designated, not dedicated. The summary of requirements and scope of work or written fee-for-service contract was not provided by the installation MEDEVAC points of contact. Fort Campbell uses Vanderbilt Lifeflight (Leineweber 2013a), a non-profit air medical service operating under Air Methods Corporation. Lifeflight is regionally integrated into the Vanderbilt University Medical Center, Level I trauma center (Vanderbilt University Medical Center 2013). Of the installations with a current MEDEVAC contract or fee-for-service agreement, two installations, Fort Benning and Fort Sill, do not have a resident MTOE or TDA air ambulance company or detachment. Fort Knox has a resident Army Reserve air MEDEVAC detachment while the other installations have resident active duty air MEDEVAC units.

Only a few installation Range Control officers, airfield managers, or EMS or fire chiefs responded to requests for information regarding installation medical evacuations by military and commercial organizations. Therefore, more information is provided on MEDEVAC missions covering Fort Hood, Fort Bragg, Fort Bliss, Fort Drum, and Fort Sill in Figure 1. All other data points were taken from back-up slides of an OTSG brief

(Installation MEDEVAC 2012). Prior to 2005, Army medical companies (air ambulance) provided installation air MEDEVAC. Air MEDEVAC missions generally decreased in subsequent years. This may be attributed to the increase in numbers of deployed units, and therefore, a decrease in present tenant units in training, rather than a change in installation MEDEVAC coverage. In correlation with training for the surge in Afghanistan, there is also a slight increase in air MEDEVAC missions between 2009 and 2010 and a general decrease in numbers of missions in the subsequent years.

However, the decrease in air MEDEVAC missions may also be attributed to the known costs incurred with the contracted or fee-for-service MEDEVAC whereas the costs were previously invisible and absorbed into military medical and aviation operating budgets. The significant downward trend of air MEDEVAC missions on Fort Hood from prior to 2005 to post 2005 appear to follow this rationale, especially with cancellation of a previous contract for dedicated coverage. With greater visibility of costs, particularly with fee-for-service agreements, the MEDEVAC missions may have been more heavily scrutinized and appropriate alternatives for MEDEVAC may have been used instead. Concurrent with having the most money allocated for fiscal year 2015 (excluding Hawaii and Alaska as outside of CONUS), Fort Bliss appears to also remain the installation with the highest number of air MEDEVAC missions. Though contracts for Alaska stated that workload is generally 10 missions a year, and the performance work statement for Fort Campbell stated that workload is generally between six and eight missions a year, the actual average number of missions are significantly less.

Aeromedical Evacuation Budgets by Installation over Time



	2007	2008	2009	2011	2012	2013	2014	2015
Hawaii	$-	$9,432,129	$9,166,447	$12,941,926	$8,503,883	$10,302,240	$10,477,378	$10,655,493
Alaska	$-	$9,957,456	$10,010,711	$8,061,435	$10,140,000	$10,302,240	$10,477,378	$10,655,493
Bliss	$5,330,000	$4,350,000	$4,430,000	$4,500,000	$5,385,607	$5,536,906	$5,703,013	$6,784,906
Drum	$2,000,000	$2,200,000	$2,200,000	$2,367,626	$1,410,342	$3,508,186	$5,420,000	$5,512,140
Benning	$1,300,000	$1,300,000	$1,650,000	$1,503,905	$3,118,970	$2,718,143	$2,764,351	$2,811,344
Hood	$2,500,000	$2,500,000	$500,000	$510,000	$517,140	$525,414	$534,346	$543,429
Stewart	$171,000	$60,000	$200,000	$204,000	$206,856	$210,166	$213,739	$217,372
Campbell	$78,000	$100,000	$165,000	$168,000	$170,352	$173,078	$176,020	$179,012
Bragg	$907,000	$38,000	$800,000	$408,081	$128,778	$130,838	$133,063	$135,325
Lewis	$95,000	$-	$100,000	$102,000	$103,428	$105,083	$106,869	$108,865
Carson	$525,000	$55,000	$60,000	$61,000	$61,854	$62,844	$63,912	$64,998
Knox	$75,000	$10,000	$60,000	$61,000	$61,854	$62,844	$63,912	$64,998
Sill	$40,000	$-	$60,000	$61,000	$61,854	$62,844	$63,912	$64,998
Riley	$485,000	$7,000	$60,000	$23,253	$21,294	$21,635	$22,002	$22,376

Figure 2. Funds Obligated for MEDEVAC over Time by Installation

Source: Created by author using data from contracts in the Defense Finance and Accounting Service Electronic Document Access, http://eda.ogden.disa.mil (accessed 13 November 2013) and from email correspondence.

Fort Drum differs from the other installations in that prior to 2012, commercial air MEDEVAC was not a viable option. The nearest commercial option, Mercy Flight, was a 27-minute flight from Fort Drum. Patient evacuations using this company exceeded the golden hour. In 2012, an air ambulance unit within 10th Combat Aviation Brigade provided air MEDEVAC support until their deployment in 2013. Over 98 percent of Fort Drum's MEDEVAC missions were completed by ground MEDEVAC. Of that percentage, about 10 percent met critical criteria to save life, limb, or eyesight. Of the MEDEVAC missions flown, 100 percent were categorized as urgent patients (Jellie 2013).

In terms of monetary cost, funds obligated for MEDEVAC have generally leveled off over time as shown in figure 2. Considering the decrease in missions, the decrease in budgets should be proportional. The exceptions to this trend are Fort Bliss and Fort Drum. MEDEVAC missions for Fort Bliss are trending towards a decline in contrast to the rising costs, which can only partially be attributed to the 1.7 percent inflation rate.

Furthermore, looking at the average annual MEDEVAC budget in comparison to the average annual number of air MEDEVAC missions, there is significant cost with little quantifiable value in figure 3. The greater the difference in height between the blue bar (budget) and the red bar (cost of a mission), the greater the number of missions and value for each mission. Even bar heights indicate single missions on average and less value for each mission. For example, the bar height difference is greatest for Hawaii, Bliss, Drum, Benning, and Hood; therefore, these installations receive more value for their budgets. The installations where the blue and red bars are at even heights may need to re-evaluate

their budgets in light of the number of missions conducted annually, particularly where the costs are significant for that installation's overall budget.

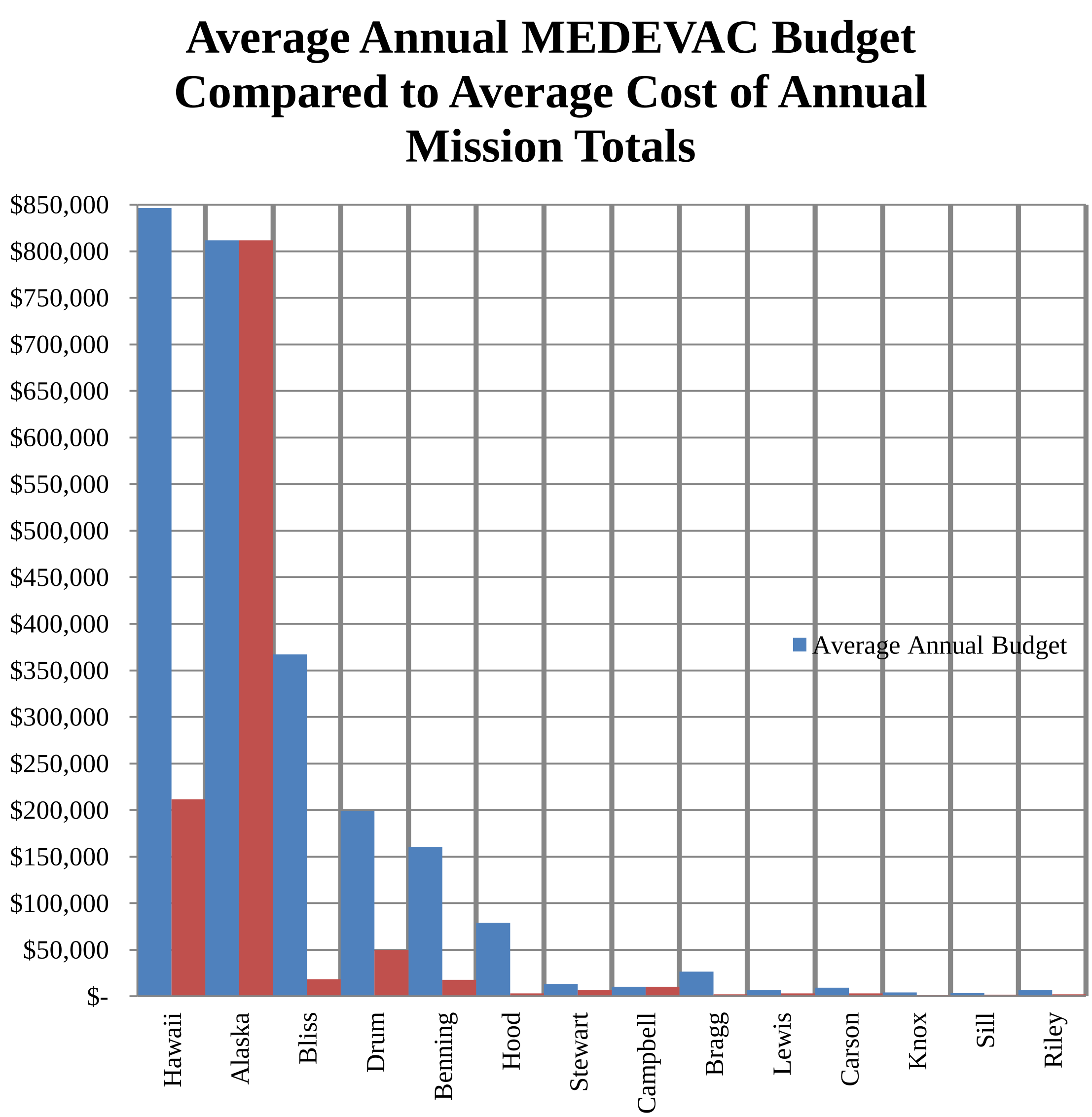


Figure 3. Average Annual MEDEVAC Budget Compared to Average Number of Annual Missions by Installation

Source: Created by author using data from email correspondence.

Cost, in terms of aviation safety, amounts to more risk in the civilian sector than in the U.S. military. The global trend for the civilian helicopter accident rate is 5.7 per 100,000 flight hours. The target goal for civilian aviation is a rate of 1.9 (Dubois 2013). The U.S. National Transportation Safety Board uses a civilian classification system for accidents in terms of “major” or “serious.” This classification system is most similar to the military’s classification system for accidents in terms of Class A or Class B. The Aviation Directorate of U.S. Army Combat Readiness/Safety Center highlights the rate of accident rate of 0.72 per 100,000 flight hours for Class A aviation accidents; this number includes both fixed and rotary wing aircraft accidents (USACRSCAD 2013b).

In a database query of fatal helicopter accidents in the National Transportation Safety Board database, about 20 percent involved commercial MEDEVAC aircraft, which included Air Methods Corporation, the company contracted to provide air MEDEVAC for a number of Army installations. Of those queried, reports showed causes ranging from pilot error to mechanical failure (NTSB 2013). According to the Air Medical Physician Association 2002 Safety Review, helicopter EMS (HEMS) follows the 20/80 accident ratio where 20 percent is due to mechanics and 80 percent is due to human error (Blumen and UCAN Safety Committee 2002, VI). However, HEMS accident rates are lower than all helicopter and general aviation rates (Blumen and UCAN Safety Committee 2002, 35). In the same study, an attempted comparison between HEMS and U.S. Army helicopter Class A and B accidents showed that HEMS accidents exceeded Army helicopter accidents in the 1980s and were similar in the 1990s. However, HEMS accidents rates began an incline in 1998 while Army helicopter accidents declined in 2000 (Blumen and UCAN Safety Committee 2002, 36). U.S. Army aviation accident

statistics for fiscal year 2014 are currently at a rate of 1.238 for Class A accidents and 0.619 for Class B accidents (USACRSC 2013).

Table 3. Evaluation Criteria 1. Cost

Value of services are equitable to amount paid measured in dollars Number of missions or patients transported in comparison to time service is available Aviation safety maximized		
Less than Desirable	Neutral	Optimal
- Reasonable availability of services with fixed pricing - Rare use of MEDEVAC - Additional burden of cost for maintenance or fuel	- Substantial assurance of available services to match real-time requirements at lowest reasonable cost - Occasional use of MEDEVAC - Meets safety standards	- Dedicated aircraft - Significant use of MEDEVAC - History of consistently exceeding safety standards

Source: Created by author.

Based upon the evaluation criteria for cost, the current system of installation aeromedical evacuation is less than desirable. Installations have reasonable availability of aeromedical evacuation services, even with fee-for-service agreements; however, the number of air MEDEVAC missions conducted at some installation may not warrant the costs incurred. Furthermore, the accident rates for commercial air MEDEVAC services are higher than military accident rates. Aeromedical evacuations in support of high-risk training, especially in remote training areas, are justifiable to save life, limb, and eyesight. The demand for MEDEVAC has already been established in previous studies. However, based on the rising costs in overall service, the decrease in numbers of

missions, and the incomparable safety records, the current system of installation air MEDEVAC is not effective.

Integration

According to the American Trauma Society, the resources available to treat a wide range of injuries categorize a medical facility. However, only the American College of Surgeons evaluates and verifies this designation, and participation in the verification process is voluntary. The facility with the highest capability from prevention to rehabilitation is classified as a Level I trauma center. The next level down is a Level II trauma center; the capabilities are similar, but the principal difference is that a Level I trauma center has organized teaching and research programs. The military equivalent to a Level I trauma center is a Role 4 medical facility, which provide definitive care and is included in the National Disaster Medical System (Department of the Army 2011, 1-15). The Army Medical Department also calls these facilities medical centers, or MEDCENs (Department of the Army 1980, 1-2). Examples include Landstuhl Regional Medical Center in Germany and the San Antonio Military Medical Center, formerly the separate entities of Brooke Army Medical Center and Wilford Hall Air Force Medical Center.

The medical overlays in the subsequent pages offer depictions of both the concentration and dispersion of medical facilities across the continental United States and provide an idea of the distances to the nearest hospital or trauma center within the golden hour. Army Regulation 40-3, *Medical, Dental, and Veterinary Care*, mandates “the aeromedical evacuation standard of a one-hour mission completion time for urgent and urgent surgical missions (time from mission request to delivery of the patient to the appropriate medical care)” (Department of the Army 2010, 57).

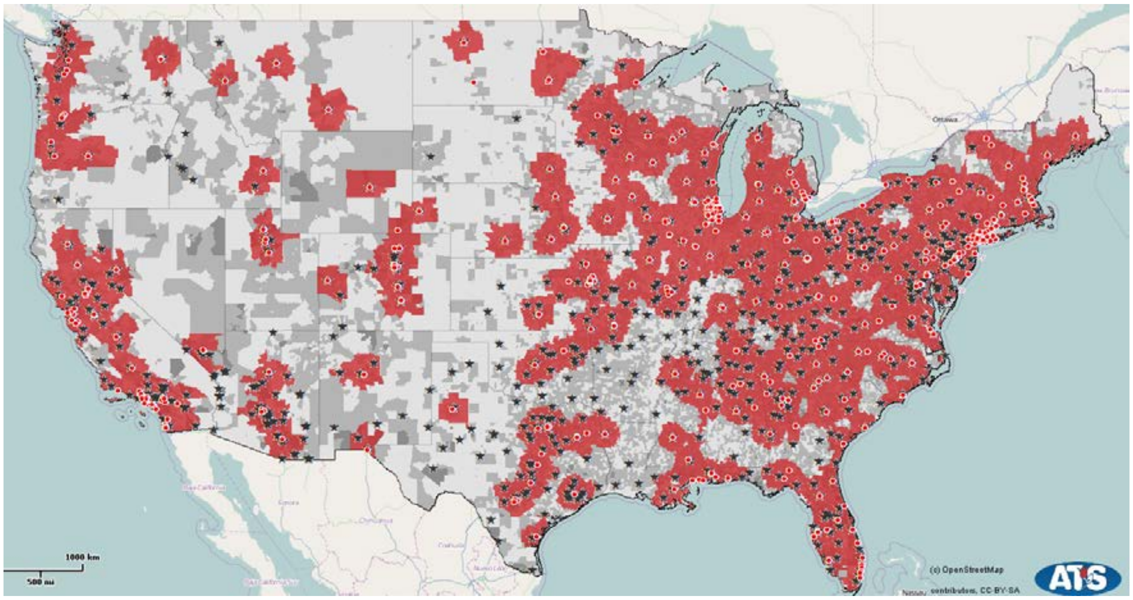


Figure 4. Trauma Centers by Helicopter Access in 60-Minutes Overlay

Source: American Trauma Society, Trauma center maps, 2010, http://www.traumamaps.org/Trauma.aspx (accessed 10 November 2013).

In the map in figure 4, the gray areas represent the population densities across the United States. The darker gray areas are more heavily populated than the lighter gray areas. The red circles with the white boundaries are the Level I and II trauma centers and include any military medical facilities that meet the standards for civilian trauma centers. The red areas behind the red circles represent the 60-minute access time by helicopter to the trauma center. The black stars represent the locations of helipads. One note on this map is that although a helipad is depicted on the map, an aeromedical evacuation helicopter or service is not necessarily associated with the helipad. Also, note the densities of trauma centers in the eastern half of the United States. Although there may not be an abundance of air MEDEVAC assets, the number and proximity of trauma centers may mitigate the lack of this asset.

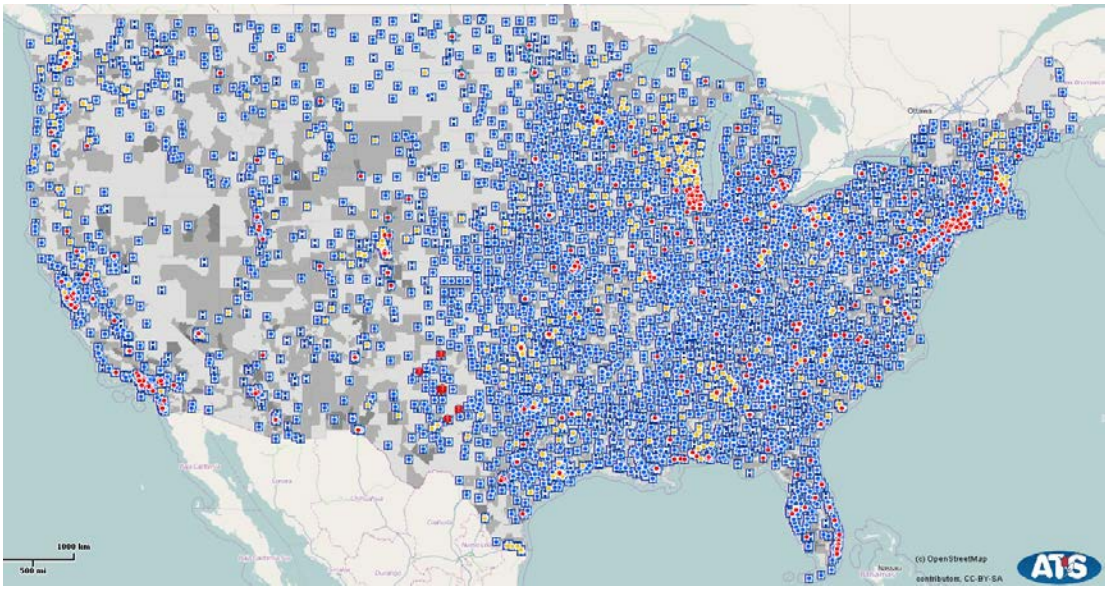


Figure 5. Trauma Centers by Ground Ambulance Access in 60-Minutes Overlay

Source: American Trauma Society, Trauma center maps, 2010, http://www.traumamaps.org/Trauma.aspx (accessed 21 November 2013).

In the map in figure 5, the red circles are again the Level I and II trauma centers. The green areas behind the red circles represent the 60-minute access time by ground ambulance to the trauma center. Ground distances severely reduce immediate access to a Level I or II trauma center, but lower level medical facilities that can provide advanced trauma level support and resuscitation are dispersed throughout the United States in great numbers. Level III trauma centers are represented by the yellow circles. These facilities can provide damage control surgery and stabilize a patient prior to transfer to a Level I or II trauma center. Level III trauma centers normally provide immediate care to communities in remote areas of the country away from Level I and II trauma centers. Blue circle represent the emergency departments across CONUS, and the blue "H" in a circle, almost indecipherable from the blue circles, represent the hospitals across

CONUS. These facilities are likely the closest level of care to the majority of the population.

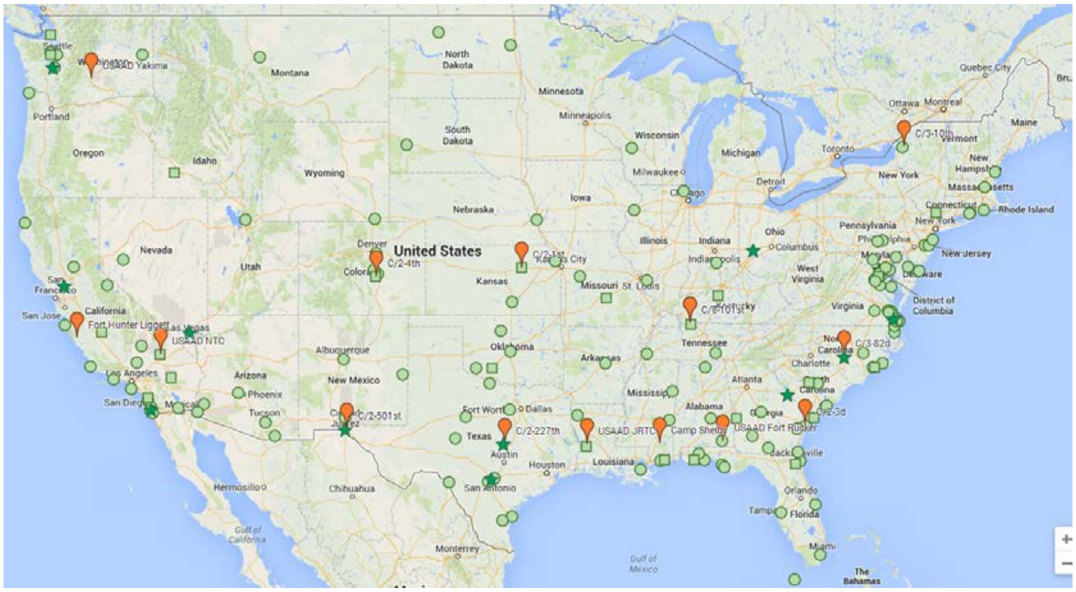


Figure 6. Military Medical Facilities and Active Duty Air MEDEVAC Companies

Source: Created by author using Google Maps Engine Lite, https://mapsengine.google. com/map/edit?mid=zKuErFpZPVA0.kc1pgOlvF5KE (accessed 10 November 2013).

The map in figure 6 depicts the locations of the military medical treatment facilities as listed by the TRICARE Management Activity (Military Health System 2013). The icons include Army, Air Force, Navy, and Marine Corps medical facilities. Dark green stars represent the Role 4 MEDCEN equivalents to the Level I and II trauma centers. Light green squares represent community hospitals similar to the civilian Level III and IV facilities, and light green circles represent clinics or ambulatory care centers, which provide mainly primary care.

The inverted orange teardrops represent the locations of the active duty Army air ambulance units. Within the U.S. Army, there are 14 active duty MTOE and five TDA air ambulance companies. Nine of the 14 MTOE active duty companies and four of the five TDA companies reside in CONUS. All active duty MTOE CONUS units are authorized 15 Blackhawk MEDEVAC helicopters, except for Charlie Company, 2d Battalion, 501st Aviation Regiment at Fort Bliss, which is authorized 12 Blackhawk MEDEVAC helicopters. Three of the four TDA CONUS units have eight Lakota helicopters on hand, and the fourth unit, Charlie Company, 2916th Aviation Battalion (USAAAD Irwin) at the National Training Center, has six Lakota helicopters (USAFMSA 2013).

Similar to the American Trauma Society maps in Figures 4 and 5, military medical facilities are predominantly in the eastern half of the United States, concentrated on the coasts, with densities in the mid-Atlantic and Northeast states and southern California. Unlike the Level I and II trauma centers, the numbers of military Role 4 MEDCENs are much more limited and are generally located towards the perimeters of the United States. The locations of the air ambulance medical companies do not appear to be arrayed in association with MEDCENs or trauma centers. As determined under the Aviation Transformation Initiative, they are aligned with the locations of the Army divisions and major training centers.

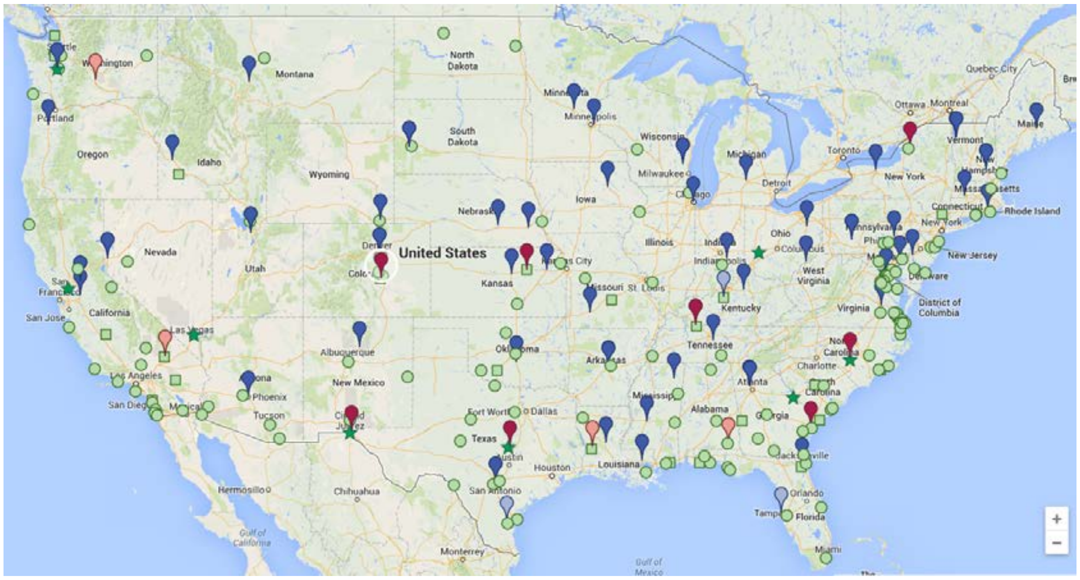


Figure 7. Military Medical Facilities and Air MEDEVAC Companies

Source: Created by author using Google Maps Engine Lite, https://mapsengine.google. com/map/edit?mid=zKuErFpZPVA0.kc1pgOlvF5KE (accessed 14 November 2013).

The map in figure 7 shows the Army Reserve and National Guard air MEDEVAC companies and detachments arrayed as proposed by the 2007 aviation realignment and as solidified by 2014 MTOEs. Dark blue inverted teardrops are National Guard units; light blue inverted teardrops are Army Reserve units. Inclusion of the Army Reserve National Guard units presents a better picture of air MEDEVAC capability, which is closely associated with population centers.

Within the U.S. Army Reserve and National Guard, there are 30 MTOE ambulance companies in CONUS. Three of the 30 are Army Reserve and 27 of the 30 are National Guard. All Army Reserve companies employ Blackhawk MEDEVAC helicopters; two of the three are authorized 15 helicopters and the third is authorized 12

helicopters. Of the 27 National Guard companies, six companies are authorized eight Lakotas, nine companies are authorized 15 Blackhawks, and 12 companies are authorized 12 Blackhawks (USAFMSA 2013).

The arrangement is a significant change from the original 2004 array in which several ARNG MEDEVAC units remained in echelons above division and several more retained their medical affiliations (Hallstrom 2007). The ARNG positioned an air ambulance detachment in nearly every state. North Dakota appears to be the obvious exception, but it has one of the least densely populated areas, two Air Force base clinics, and three civilian trauma centers available within the state.

Table 4 lists the installations with Army air ambulance companies as tenant units, installations covered by tasking air ambulance detachments for support, and installations covered by civilian air MEDEVAC contracts or fee-for-service support. The installations with the greatest number of resident active duty service members are listed first.

Based on active duty population numbers, there does not appear to be a direct correlation with requirements for MEDEVAC support. The populations for the three installations with air ambulance detachments, Fort Rucker, Fort Polk, and Fort Irwin, do not account for the rotational training units, which can temporarily surge population numbers to an additional 5,000 to 10,000 service members.

The number of aircraft (active duty and ARNG units) on or within a 60-minute flight to the installation compared to the number of active duty on that post provided interesting ratios. Fort Wainwright, the installation with the third smallest population of active duty personnel, had the greatest ratio of MEDEVAC aircraft to personnel. When accounting for the difference in litter capacities between the Blackhawk and Lakota and

the surge in population during rotational training that is also normally high risk, the installations with the USAAADs had the lowest ratio of MEDEVAC aircraft to personnel.

Table 4. Defense Health Agency Populations by Catchment Area (Fiscal Year 2014)

Installation	Active Duty	Active Duty Dependents	Guard & Reserve	Retirees	Others	Totals
Bragg	51,161	73,835	1,920	26,818	49,069	202,803
Hawaii *	48,243	61,187	2,059	15,364	30,241	157,094
Hood	41,586	58,665	798	22,211	41,333	164,593
Carson	38,336	54,162	1,150	28,010	51,033	172,691
Lewis-McChord	38,325	54,900	2,181	29,598	52,605	177,609
Campbell	31,301	45,346	406	11,773	23,653	112,479
Bliss *	28,585	38,573	501	10,822	21,922	100,403
Benning *	24,468	26,278	545	12,277	23,349	86,917
Stewart	23,265	33,645	751	10,605	20,745	89,011
Drum*	22,396	33,554	5,228	35,291	60,891	157,360
Riley	17,776	23,089	315	3,864	8,762	53,806
Sill	14,681	14,089	361	6,835	12,816	48,782
Hunter Liggett	13,572	20,406	1,596	36,290	61,782	133,646
Knox	10,212	12,685	1,626	13,325	25,870	63,718
Rucker **	9,018	21,277	3,851	53,984	91,993	180,123
Polk **	8,523	11,783	141	6,194	3,097	29,738
Wainwright *	8,224	10,613	299	1,881	4,265	25,282
Irwin **	4,195	5,713	82	690	1,490	12,170
Shelby, MS	3,482	5,695	3,276	17,903	36,572	66,928

* denotes installation covered by commercial air MEDEVAC
** denotes installation covered by military air MEDEVAC

Source: Created by author using Defense Health Agency Zip Code–Catchment Query Tool and TRICARE Operations Center Eligibility Reports 2014, http://www.tricare.mil/tma/gri/ziptool/search.aspx, http://mytoc.tma.osd.mil/Eligibility/TOC/Population Summary.htm (accessed 10 November 2013).

One of the principles of military health service support is continuity. This is defined as providing the level of care appropriate to the patient's condition by evacuating that patient through the system of progressive capabilities extending from point of injury or illness to definitive care as needed. The military health care system is linked across roles of care, from Role 1Battalion Aid Station through Role 4 MEDCEN. However, the military health system is not necessarily integrated with civilian medical treatment facilities except through the TRICARE system of referrals. At individual installations, each medical facility coordinates with the required levels of care or for specialize care.

For instance, on Fort Leavenworth, Munson Health Center provides primary care, but it does not have the full capability of a hospital emergency room to treat medical emergencies. Therefore, Leavenworth County dispatches civilian EMS to Fort Leavenworth and transports the patient to the next higher level of care (Copp 2013). Similarly, Weed Army Community Hospital on Fort Irwin uses the USAAAD to transport medical emergencies to Balboa Naval Hospital in San Diego, University of Las Vegas Medical Center, or Loma Linda University Medical Center to treat cardiac, pulmonary, or neurological patients beyond the hospital's capability. A written memorandum of agreement or contract is not normally necessary for use of the services at these medical facilities as long as TRICARE Management Activity can manage medical costs to coordinate payment.

However, in cases of mass casualties or large scale disasters with the potential for overwhelming normal medical resources, military integration and prior coordination with civilian medical facilities would provide optimal care. Not all military medical facilities are required to have this type of integration, and because the Role 4 is a non-deployable

entity, the MEDCEN is normally the only DoD facility integrated into the National Disaster Medical System. Medical evacuation in Defense Support of Civil Authorities falls under the purview of U.S. Transportation Command for medical regulation and patient tracking (Force Health Protection and Readiness Policy 2010). However, the assets normally used are fixed wing aircraft.

When not deployed, Army air ambulance companies remain available to conduct MEDEVACs in support of DSCA operations as assigned by the Secretary of Defense. This use of DoD MEDEVAC capability was highlighted with the Army's most recently activated air ambulance company, Charlie Company, 2d Battalion, 4th Aviation Regiment, from Fort Carson. They conducted 43 hoist missions and helped to evacuate over 3,054 people from the Colorado floods in September (Dunbar 2013).

Contracted air MEDEVAC companies normally have a 15-minute response time, from receipt of mission to airborne, and are stationed within the parameters of their performance work statement. Their positioning within or near the installation allows them to evacuate patients within the required golden hour to the appropriate level of care. Commercial air MEDEVAC companies are not involved with DSCA like Army MEDEVAC units are since their sole purpose is support to the installation. Additionally, it would neither be cost-effective or an efficient use of resources. Though civilian air ambulance companies are unsuitable for DSCA, their presence performing installation support allows military MEDEVAC companies to conduct their assigned DSCA missions when not deployed.

In some situations, such as extreme emergencies, no formal agreements are required to evacuate a patient to a higher level of care; a simple phone call to the

accepting facility would suffice. However, a habitual relationship would better facilitate the MEDEVAC. This ensures enroute communication to update the receiving facility on patient status as well as inform the facility on estimated time of arrival. Providing these updates on patient condition and flight path, particularly in changing inclement weather conditions, like at Fort Drum or Fort Wainwright, helps the receiving facility anticipate patient needs. Most installation medical treatment facilities and emergency services maintain local-level written agreements with the surrounding community.

Table 5. Evaluation Criteria 2. Integration

Less than Desirable	Neutral	Optimal
Proximity to Level I or II trauma center measured by time-distance Availability for Homeland Defense and Homeland Security (DSCA) missions		
- Capability provided in a time frame consistent with patient needs - Reasonable availability in accordance with proposed schedule for DSCA missions	- Coordinated medical support agreement with receiving facility - Substantial assurance of MEDEVAC support within desired time period for DSCA missions	- Integration with military and civilian health system - MEDEVAC positioned to provide local and regional support for DSCA missions

Source: Created by author.

Based upon the evaluation criteria for integration, the current system of installation aeromedical evacuation is neutral. Coordinated medical support agreements with receiving facilities exist at a local level, Additionally, the presence of a military air ambulance company on an installation or within a region gives DoD flexibility in DSCA operations. The presence of a support agreement with a commercial MEDEVAC company does not provide this same flexibility.

Control Mechanisms

Control mechanisms refer to the ability to respond to a request for MEDEVAC, to include informing all necessary organizations and delivering the patient to the appropriate medical treatment facility without increasing mortality and morbidity rates.

Air Methods Corporation is the dominant commercial MEDEVAC in CONUS. Although Vanderbilt University provides MEDEVAC service for Fort Campbell, Flight for Life Colorado provides MEDEVAC service for Fort Carson, and Mediflight of Oklahoma provides MEDEVAC service for Fort Sill, each company utilizes helicopters operated by Air Methods Corporation (Vanderbilt University Medical Center 2013, Flight for Life Colorado 2013, Mediflight of Oklahoma). Air Methods provides overwatch of all of its aircraft across the country through a centralized operations control center based in Englewood, Colorado, that provides up-to-date weather reports and alternate flight paths (Maag 2010). This control central maintains direct communication with the pilot through satellite phone, redundant systems, and use of its national communications facility designed for emergency communications (Air Methods 2013); these capabilities are typically only associated with the military. Air Methods Corporation also has DirectCall, a service where its staff implements an efficient communication system to assist a referring medical facility in ensuring the transfer of a patient by to an accepting medical facility.

In contrast, University of North Carolina Air Care provides MEDEVAC support for Fort Bragg and operates an integrated regional hospital based system. UNC Air Care incorporates Rex Healthcare Hospital in Raleigh, Cape Fear Valley Medical Center in Fayetteville, and ground transportation stations in Henderson and Erwin. It maintains its

two aircraft, helipads, and own refueling facilities and provides on-scene call services to Fort Bragg's training range (UNC Air Care 2013).

Table 6. Installation Air MEDEVAC Proponents

Installation	Time Available	Contractor	Proponent
Alaska	24 hours / daily	Evergreen Helicopters, Inc Juan Landazuri 3850 Three Mile Ln McMinnville, OR 97128-9496	LADD Army Airfield JD Smith Bldg 1558, Front Street Fort Wainwright, AK 99703
Hawaii	24 hours / daily	Evergreen Helicopters, Inc 3850 Three Mile Ln McMinnville, OR 97128-9496	USAG Hawaii Dir or PTM Bldg 207 159 Santos Dumont Ave Schofield Barracks, HI 96857
Fort Bliss	24 hours / daily	Air Methods Corporation 7301 S Peoria Englewood, CO 80112-4133	USAG Fort Bliss Bldg 2527 Chaffee Rd Fort Bliss, TX 79916-2527
Fort Drum	24 hours / daily	Air Methods Corporation 7301 S Peoria Englewood, CO 80112-4133	Directorate of Emergency Services DES Bonnie Lutz Law Enforcement Command 10715 Mt Belvedere Blvd Fort Drum, NY 13602-5027
Fort Benning	12 hours / 3-7 days / week	Air Methods Corporation 7960 Jecelin Road, Bldg 2485 Fort Benning, GA 31905-9431	DOT DPTM AVN DIV Lawson Army Airfield 6751 Constitution Loop Fort Benning, GA 31905
Fort Bragg	service period	University North Carolina Hospitals 101 Manning Dr Chapel Hill, NC 27514-4220	USAG Fort Bragg USAG Dir Sup Acct J 2050 Cook Street Fort Bragg, NC 28310-5000
Fort Campbell	24 hours / daily / service period	Vanderbilt University DBA Vanderbilt University Med Ctr 3319 West End Avenue Nashville, TN 37203-6869 [Air Methods Corporation]	(list of military personnel)
Fort Carson	service period	Flight for Life Colorado 11600 W 2nd Place Lakewood, CO 80228 [Air Methods Corporation]	
Fort Sill	service period	Mediflight of Oklahoma Air Evac Lifeteam 1001 Boardwalk Springs Place, Suite 250 O'Fallon, MO 63368 [Air Methods Corporation]	

Source: Created by author using contract data and data from email correspondence.

Despite a national and worldwide presence, the U.S. military does not operate a comparable centralized air traffic control center in garrison, nor are its medical protocols uniformly integrated into the MEDEVAC request process. Each installation has its own procedures and means for handling calls for MEDEVAC.

Standard procedures in most military training areas and garrison is placing a 911 call and reaching an emergency operator to request MEDEVAC. However, on a military installation, using a cell phone to dial 911 reaches a county or city emergency operator instead of a base emergency operator. Using a cell phone adds time to the process by having to transfer the emergency call from the county or city operator to the military base emergency operator. In a training area, the call is normally made over radio frequency to Range Control. Range Control routes the request to the emergency management center, usually controlled by the installation fire department. If the supporting air ambulance unit does not monitor a specified radio frequency for MEDEVAC calls, Range Control makes the initial contact with the unit, and additional time is added to the process.

Once Range Control receives the MEDEVAC request, they must inform several agencies. If the request is for ground MEDEVAC or a ground ambulance exchange point, Range Control notifies the fire department for EMS, specifically a medical first responder and medical transportation. Some installations also notify the local medical treatment facility for potential receipt of the patient. If the request is for air MEDEVAC, either Range Control or the emergency management center (fire department) notifies the supporting air MEDEVAC unit of the MEDEVAC request to retrieve, triage, and medically regulate the patient to the appropriate medical facility based on injury or illness. The contracted commercial company’s own medical director generally provides

medical oversight. Military MTOE air ambulance companies rely on their flight surgeons. Military TDA air ambulance companies coordinate with the local medical treatment facility. Range Control notifies the installation air traffic control point and all units to pause training in order to deconflict air space. Range Control must also notify the installation emergency operations center for garrison command to maintain situational awareness.

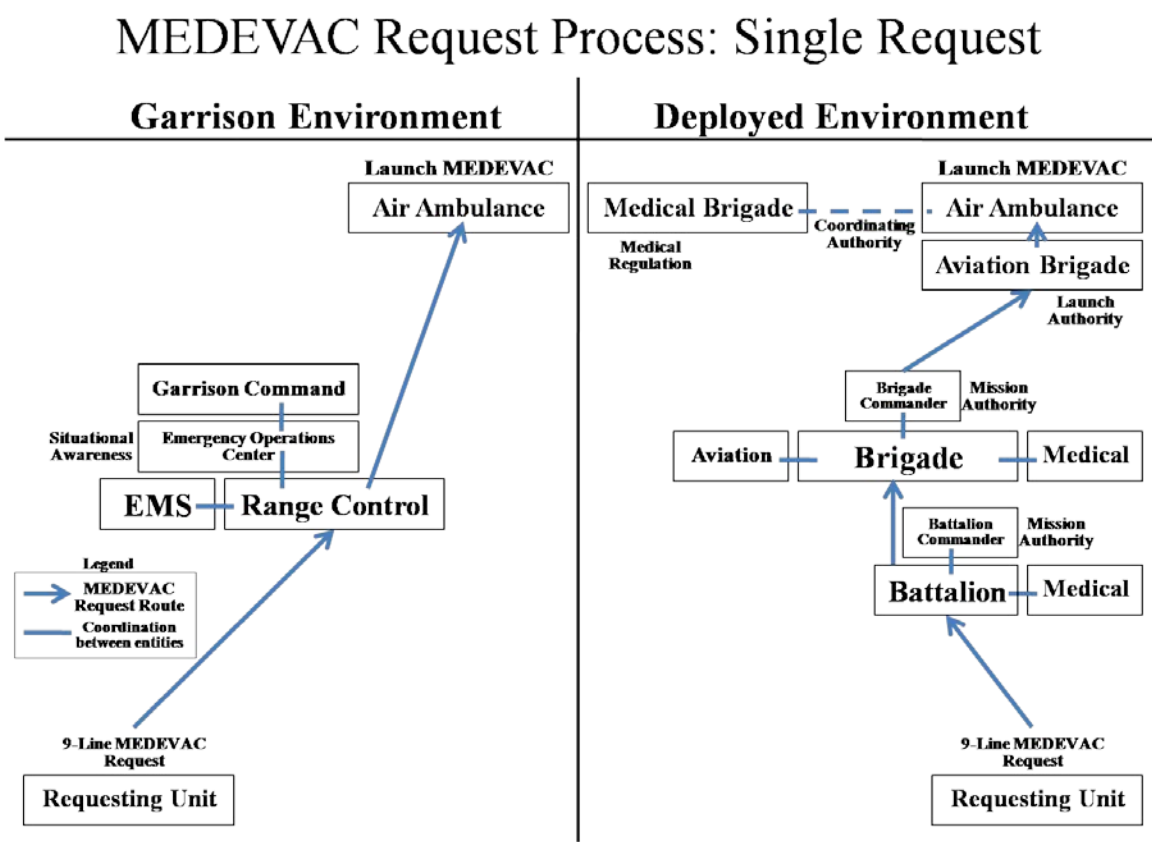


Figure 8. MEDEVAC Request Process: Single Request

Source: Created by author.

The garrison MEDEVAC request process relies on coordinating authorities and differs significantly from the MEDEVAC request process in a deployed environment. According to Training Circular 1-400, *Brigade Aviation Element Handbook*, MEDEVAC missions require two authorizations, mission authority and launch authority (Department of the Army 2006, 5-2). In the deployed environment, the requesting unit sends the MEDEVAC request to their higher headquarters, their battalion. At the battalion level, a senior medical person, usually the medical platoon leader or battalion surgeon, validates the medical requirement. Based on medical recommendations, the battalion commander decides whether to facilitate the MEDEVAC request to brigade. At brigade, the senior medical person validates the use of air MEDEVAC based on medical necessity and MEDEVAC aircraft availability, and the brigade aviation element validates clearance of air space. The brigade commander grants mission authority, and the MEDEVAC request passes to the aviation brigade commander for launch authority. The aviation brigade commander makes the collective risk assessment based on the overall tactical situation, weather, and fighter management. The request for MEDEVAC is fluid, and mission and launch authorities are normally implied if a single request is made. When multiple requests for MEDEVAC support are made nearly simultaneously or when significant risk is involved, MEDEVAC missions require active decisions by the mission and launch authorities.

Many installations do not have written protocols for handling a second MEDEVAC request in the same time span as the first or for ensuring MEDEVAC is allocated based on medical necessity instead of in the order of the calls received. This is where control mechanisms are unrefined. Regulations and standard operating procedures

hold commanders of units conducting training responsible for mitigating risk and implementing control measures to ensure soldier safety and survival. They are the senior leader tasked to make the decisions that may or may not save a life. However, the question that remains is which senior commander will make the decision to allocate and launch MEDEVAC assets when separate units operating outside of a common chain of command request MEDEVAC at the same time.

Fort Campbell's MEDEVAC procedures depends on the "unit commander, O[fficer] I[n] C[harge], or S[afety] O[fficer] . . . based on the advice of the senior medical person present" to determine appropriateness of air or ground (HQ, 101st Airborne Division 2007, 12). The regulation does not indicate who decides where to commit the MEDEVAC element if more than one call for MEDEVAC is made.

Fort Carson has a stand-alone document and a more in-depth MEDEVAC procedure that considers MASCAL events. It provides the time-distance analysis on ground and air MEDEVAC, identifies the MEDEVAC limitations, and supplies risk mitigation guidelines. It also designates EMS as the organization to medically regulate and coordinate transportation with the appropriate receiving hospital (Ellis 2012, 3-5). The SOP stipulates that commercial air MEDEVAC service is provided on a first come, first service basis to anyone within the 300-mile radius of Colorado Springs. Therefore, the decision to commit air MEDEVAC is outside of military decision-making control.

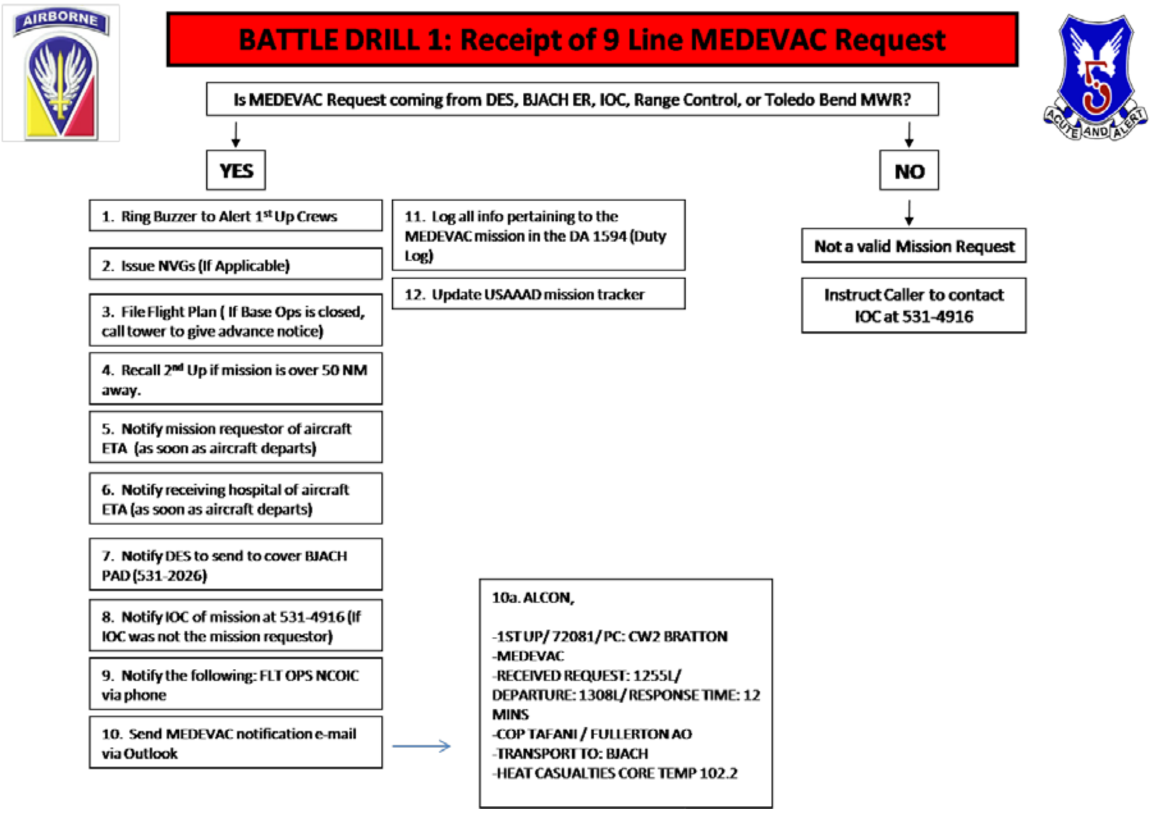


Figure 9. Fort Polk MEDEVAC Flight Operations Procedures

Source: Major Justin Avery, C Company, 2916th Aviation Battalion (USAAAD Irwin) Commander, Email document to author, "Flight Operations Battle Drills." 6 April 2013.

U.S. Army Air Ambulance Detachments (USAAAD) provide MEDEVAC support to Fort Irwin Fort Polk, Yakima, and Fort Rucker, and their procedures are similar. Given the remoteness of both Fort Irwin and Fort Polk, MEDEVAC requests may come from the rotational training unit through Range Control, from the local medical treatment facility for patient transfers, or from anyone requiring support from within the installation.

Given the number and diversity of where requests originate, a higher authority does not exist to determine mission priorities and which missions will or will not be

supported (Avery 2013). The USAAADs on Fort Irwin, Fort Polk, and Yakima, are assigned to Headquarters, U.S. Army Forces Command according to their TDAs. The USAAAD at Rucker is assigned to Headquarters, U.S. Army Aviation Center of Excellence, which is assigned to Headquarters, U.S. Army Training and Doctrine Command (USAFMSA 2013).

However, FORSCOM and TRADOC are not involved in an installation's MEDEVAC request process, nor is it recommended that they have ultimate decision-making authority over this process. For example, in the case of Fort Irwin, no GSAB or aviation brigade exists on Fort Irwin. The USAAAD reports to the 916th Support Brigade for administrative purposes, but the 916th Support Brigade has no role in deciding MEDEVAC missions. The volume of MEDEVAC calls comes from the rotational training unit conducting high-risk training, and Operations Group, the organization providing the Observer Controller/Trainers, oversees this high-risk training. Operations Group has no command authority over the USAAAD, but this organization would have a stake in when and where air MEDEVAC is employed. The senior commander is the commanding general of the National Training Center (NTC). If weather conditions, such as high winds or low visibility exist, the commanding general must decide whether to override normal flight protocols and accept risk to launch air MEDEVAC. NTC does not have a formal written process to assist the commanding general in making this decision. The NTC Surgeon Section, an element assigned to Weed Army Community Hospital, provides medical oversight to Operations Group and advises the commanding general in medical protocols. However, the section is neither staffed nor equipped to monitor MEDEVAC requests continuously. The most senior aviation commander at NTC is the

USAAAD commander, and though his company executes MEDEVAC missions, he does not report directly to the NTC commanding general.

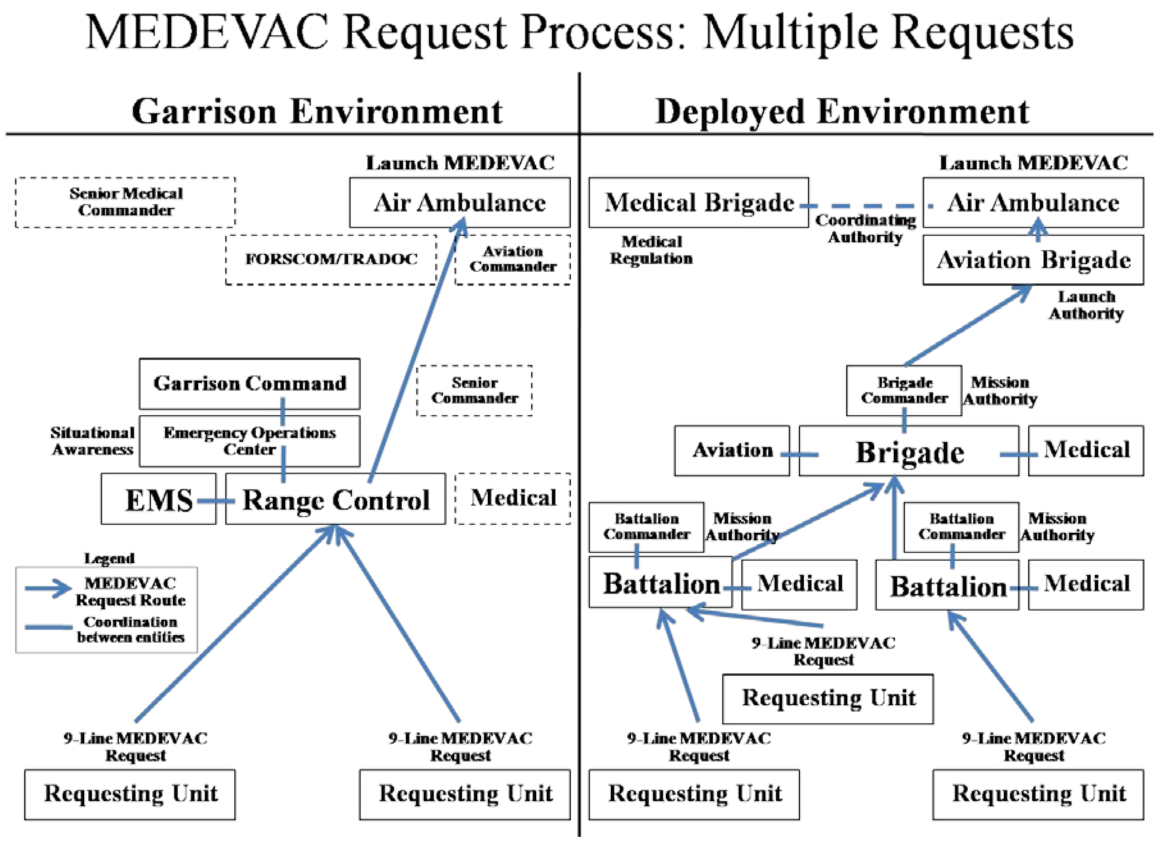


Figure 10. MEDEVAC Request Process: Multiple Requests

Source: Created by author.

In contrast, in the deployed environment, when there are multiple requests for MEDEVAC, the requesting units' higher headquarters reviews the request based on patient urgency, asset availability, and risk. The medical officer validates the medical requirement, establishes medical priorities, and recommends a mission platform. The battalion commander, the decision-making authority, authorizes submission of the

request to higher. At brigade, the same process occurs in conjunction with aviation recommendations. Once mission authority is established, the brigade submits the MEDEVAC request to the aviation brigade for launch authority. During this process, the air ambulance unit coordinates with the medical brigade on where to medically regulate patients. The medical brigade commander is normally the senior medical commander whose medical regulating section has oversight in coordinating patient movement to ensure availability of bed and specialty care, and to prevent accumulations of patients awaiting treatment at any one facility.

The current installation MEDEVAC system lacks the medical oversight to validate requirements based on patient precedence and make recommendations on type of MEDEVAC platform based on medical protocols and resource availability. Furthermore, the current system lacks an identified decision maker to determine mission and launch authority. Lastly, the system lacks a senior medical commander to ensure proper patient medical regulation. The current system is dependent on the first responder (paramedic or nurse) to determine the patient's medical destination. This gap in control mechanisms is particularly pertinent with installations covered by contracted commercial air MEDEVAC. Unless written into the performance work statement, there is no back-up MEDEVAC aircraft and crew to employ once the contracted MEDEVAC is on a mission.

This prompts the question of who is responsible for installation MEDEVAC. Each installation manages its own MEDEVAC coverage, and often times, the EMS or fire chiefs manage ground MEDEVAC and monitor air and ground MEDEVAC support. According to Army Regulation 95-1, *Flight Regulations*, "Installation/senior mission commanders in coordination with . . . Army aeromedical evacuation unit commanders

will develop written policies that establish specific procedures for notification, mission, acceptance, and launch authority" (Department of the Army 2008, 11). The installation commander is not always the senior general officer on the installation, and the above statement excludes the importance of senior medical commander involvement.

IMCOM is the "Army's single authority and primary provider of base support services" (U.S. Army War College 2011, 23). It provides the land and training areas to support soldier preparations and deployment readiness (U.S. Army War College 2011, 421). IMCOM provides funding to garrisons, implements Army-wide standards and "ensur[es] equity among installations" (U.S. Army War College 2011, 424). Its management activities and programs also include privatizing, outsourcing, and competitive sourcing in order to leverage technology, obtain the most cost effective services, and make better use of existing resources to accomplish its mission. Because of the scope of IMCOM's responsibilities and areas of expertise, it is a potential proponent for installation aeromedical evacuation

FORSCOM manages Army Force Generation, the Army's process for cycling units through training, establishing unit readiness, and deploying units for missions across the full spectrum of operations. FORSCOM uses this process to manage mission requirements by prioritizing resources over time (U.S. Army War College 2011, 15). Once deployment requirements decrease to the levels prior to the 11 September 2001 attacks and the number of units in reset decrease, military air MEDEVAC have the potential availability to conduct installation MEDEVAC. Contingent on these conditions, FORSCOM is a potential proponent for installation aeromedical evacuation.

TRADOC manages the majority of the Army's institutional training. Of particular interest are the major subordinate organization for Initial Military Training and the Centers of Excellence (CoE), such as the Maneuver CoE at Fort Benning, the Fires CoE at Fort Sill, and the Aviation CoE at Fort Rucker. These organizations are responsible for conducting a substantial number of high risk training events on a daily basis across several installations. A form of medical support and MEDEVAC is normally a risk mitigation requirement for these types of high risk training events. Therefore, based on training requirements, TRADOC is a potential proponent for installation air MEDEVAC.

MEDCOM directs, manages, and monitors the full spectrum of health services, particularly patient care for the armed forces in both deployment and garrison. Furthermore, MEDCOM has a presence at nearly every Army installation, though staff size ranges from ambulatory care clinic to medical center. Although, the aviation community is the proponent that owns the aircraft, the medical community is the proponent for the people, the services, and the aeromedical training. Based on medical requirement, MEDCOM is a potential proponent for installation air MEDEVAC.

Based upon the evaluation criteria for control mechanisms, the current system of installation aeromedical evacuation is neutral. Air Methods Corporation operates the aircraft used in a number of the installation air MEDEVAC agreements. They have optimal control mechanisms to ensure seamless aeromedical evacuation of patients. However, the evaluation criteria is neutral because installations have a centralized point of contact in Range Control and medical regulation is conducted by the first responder. On the other hand, they generally do not have medical oversight or established

mechanisms in place to process requests where a decision must be made on where to commit resources or how to prioritize requests. They simply facilitate the request process.

Table 7. Evaluation Criteria 3. Control Mechanisms		
Centralized point of contact for receipt of mission, provision of aviation information Medical oversight in determination of mission priority Medical regulation of patients Seamless transition to next higher level of care		
Less than Desirable	Neutral	Optimal
- Centralized point of contact without medical oversight - Medical regulation by first responder	- Centralized point of contact includes medical oversight - Medical regulation by first responder	- Centralized point of contact with medical oversight - Medical regulation through coordinated communication with regional medical system

Source: Created by author.

One can argue the decision to commit resources is the commander or senior person's prerogative, but the questions remain at which commander's level is this appropriate and who is the decision-making authority. Similar to the deployed MEDEVAC request process with a centralized decision-making authority and medical oversight, installation MEDEVAC requires the same control mechanisms. One must recognize that air MEDEVAC personnel and aircraft are limited.

All active duty MTOE air ambulance companies are assigned to divisions and aligned under general support aviation battalions in order to mirror their support arrangements in logistics, maintenance, communications, and operations in combat. This arrangement builds the habitual relationships between the air MEDEVAC unit and the

directly supported brigade to facilitate fully integrated aviation operations. However, brigades are not the only units in a combat environment; echelon above division or corps units also exist in support of the brigades and overall operations in theater. Therefore, in addition to the air ambulance detachments in direct support, there are normally theater-level aviation brigades with air ambulance companies in general support.

An additional control mechanism for MEDEVAC in combat is the theater medical evacuation plan. This plan synchronizes medical evacuation assets to ensure theater coverage, effective integration of air and ground platforms, and maximized access to MEDEVAC in space and time. There needs to be a similar control mechanism in garrison to leverage Fire and EMS ground ambulance services in conjunction with air ambulances more effectively.

Chapter Review

In the previous sections, assessments for each of the evaluation criteria were determined. Cost was less than desirable. Integration was neutral. Control mechanisms were neutral. The aggregate assessment is the answer to the primary question. Based on the aggregate assessment, the current system of aeromedical evacuation in support of Army installations is therefore neutral. The caveat is that based on the unique characteristics of each installation's mission, geography, demographics, and tenant resources, in conjunction with external factors such as weather and time of year, no single MEDEVAC composition or configuration will fit all installations.

Having discussed the evaluation criteria in assessing the effectiveness of installation aeromedical evacuation, the next chapter will provide conclusions and some recommendations.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The question of whether the current system of aeromedical evacuation in support of Army installations is effective is a complicated one. Based on the evaluation criteria of cost, integration, and control mechanisms discussed in the previous chapter, the answer to whether installation MEDEVAC is effective is mostly neutral.

In terms of cost, data collection from all of the installations was not complete; therefore, trends could not be verified. However, services were generally available. Requests for MEDEVAC occurred and missions were completed. Senior commanders accepted risk based on known limitations and safety standards. On the other hand, the value of services compared to the dollar amount paid and the history of the use of MEDEVAC aircraft were less than desirable at some installations. Overall, this made cost less than desirable.

In terms of integration, civilian and military medical treatment resources were in close proximity to the identified eligible populations at risk. In the absence of nearby trauma centers, the presence of air MEDEVAC agreements mitigated the time and distance to the appropriate medical treatment facility. However, integration between medical treatment facilities was not readily apparent nor was the incorporation of MEDEVAC assets, active duty or ARNG, with installation medical treatment assets uniformly evident. MEDEVAC units were in nearly every state, placing them in optimal position for potential DSCA missions. However, installations with only a civilian

contracted form of MEDEVAC support do not have the flexibility to support DSCA missions. Therefore, the criteria of integration remained neutral.

In terms of control mechanisms, civilian contracted MEDEVAC under Air Methods Corporation provided optimal centralized aircraft and medical oversight, and installations had processes in place for initiating MEDEVAC requests. However, these processes did not thoroughly incorporate medical oversight into determining priorities or identify the mission prioritization authorities to ensure effective use of MEDEVAC resources. This absence of process potentially affects timely response from receipt of the MEDEVAC mission to the delivery of the patient to the medical facility. Consequently, the criteria of control mechanisms were assessed as neutral.

Assessing the effectiveness of the current installation aeromedical evacuation system was difficult because of three key points. One, data management on mission information is incomplete, data collection requirements did not appear uniform across the installations, and sources were not open for analysis. Each garrison may have better information about its MEDEVAC program at its own installation. One installation provided an IMCOM MEDEVAC Mission Report. Refer to Appendix C for the format. On the other hand, there are no clear indications that IMCOM maintains a knowledge management database for visibility and tracking installation MEDEVAC statistics and funding. Two, the absence of clear post-fiscal year assessments based on operational need undermine the ability to determine the cost effectiveness of current contracts. Analysis of the existing contracts within the Defense Finance and Accounting Service Electronic Document Access shows no obvious adjustments to subsequent contracts based on annual evaluation of MEDEVAC missions. Furthermore, funding changes for additional high

risk training events, though warranted, do not appear to be captured in a holistic summary of projected estimates for subsequent contracts. Three, there has been limited guidance on recommended costs, integration, and control mechanisms for installation MEDEVAC. This is likely due to delegated authority given to senior mission commanders, installation commanders, and senior medical commanders to identify and define separate installation critical requirements.

Recommendations for Further Research

Recommendations for further research center on a more complete compilation of MEDEVAC mission statistics and funding and analysis of aeromedical evacuation assets outside of the United States. Many changes have occurred since the Aviation Transformation and the Medical Restructuring Initiatives and ongoing unit realignments. Few studies have been as comprehensive as the unpublished 2002 CONUS Installation Medical Evacuation Analysis written by Colonel Randall Anderson as the Office of The Surgeon General's Aeromedical Evacuation Officer. Using the same or similar criteria in the original study to re-assess MEDEVAC installation support priorities would most likely yield unambiguous results and alter the current recommended courses to action to solve the issue of installation MEDEVAC coverage.

Furthermore, this study does not use patient outcomes to assess MEDEVAC effectiveness; however, no reports of negligent deaths or additional injuries due to ineffective MEDEVAC have been evident. Therefore, one can assume the current system for installation MEDEVAC is working. However, to gain a true understanding of the effectiveness of MEDEVAC, patient outcomes must be reviewed.

Recommendations for Decision-Makers

Recommendation for decision makers is to maintain a hybrid of the current installation aeromedical evacuation system. Army MEDEVAC was designed to deploy in support of operations; therefore, installation support is not their primary mission. However, while not deployed, it would be cost effective to employ their capabilities, particularly when the cost of a single mission far exceeds the total number of missions conducted in a single year. Because of the universal absence of equivalent civilian air MEDEVAC capability in isolated areas like the islands of Hawaii or the mountains of Alaska, the costs for MEDEVAC is astronomically high in comparison to CONUS. Particularly with Alaska, which has one of the smallest eligible populations and one of the lower number of missions, MEDEVAC missions would be more cost effective when covered by military MEDEVAC. This is particularly applicable because Alaska has the harsh weather, terrain, and altitudes that military MEDEVAC may fly and navigate through that civilian MEDEVAC may not.

Another recommendation for decision makers is the re-evaluation of MEDEVAC agreements with commercial MEDEVAC companies that charge based on fee for service. The cost of miscellaneous aviation support requirements appeared to vary across contracts, and the cost of total service may be cheaper if negotiated holistically versus across installations, particularly since multiple installations either directly or indirectly employ Air Methods Corporation.

Lastly, the most pressing recommendation for decision makers is the implementation of control mechanisms to determine mission priorities and validate medical requirements. In the case of commercial MEDEVAC, unless stipulated in the

performance work statement, there is no back-up aircraft and crew available. Subsequent requests for MEDEVAC must wait until the designated MEDEVAC aircraft and crew returns from their first mission. In the case of Army TDA MEDEVAC units, first-up crews have second-up crews for back-up. However, their mission sets are as numerous and diverse as that of a deployment and the populations they support can quickly exceed their individual unit capabilities. Therefore, medical oversight, an identified decision-making authority, and an integrated installation MEDEVAC plan, as cited in Army Regulation 95-1, become critical to mitigate risk.

Final Thoughts

The United States Army has the United States Armed Forces' only tactical aeromedical evacuation capability. The United States Navy formed the 2515th Naval Air Ambulance Detachment in support of MEDEVAC operations in Kuwait and Iraq, but its existence was short-lived though its contributions were significant in saving lives. Understanding this critical mission of evacuating the sick or injured is paramount to effectively employing the vital capability the air ambulance companies bring to deployment and garrison operations. Despite the military's renewed immersion in financial constraints, cost should not be the overriding factor for reducing the availability of aeromedical evacuation. The measure of effectiveness for medical care and evacuation that our military and civilian brethren deserve is nothing less than the best, and thus far only military MEDEVAC has met this standard of care. Our Army MEDEVAC pilots and their crews understand this notion. Only they live and breathe this concept as Major Charles Kelly did in creating the legacy of responding unhesitatingly to the MEDEVAC call of "When I have your wounded."

GLOSSARY

Aeromedical Evacuation. Movement of patients under medical supervision to and between medical treatment facilities by air transportation; air MEDEVAC

Catchment Area. Military Health System geographic boundary or market area within 40-miles for patient and referral care

Class A Accidents. Most severe events where total cost of damages is $1 million or more, aircraft is destroyed, or fatality or disability occurs; most similar to National Transportation Safety Board classification of "major" accident: aircraft is destroyed, multiple fatalities, or one fatality and substantial aircraft damage

Class B Accidents. Total damage is between $200,000 and $999,999, permanent partial disability occurs, or three or more personnel are hospitalized because of a single accident; most similar to National Transportation Safety Board classification of "serious" accident: single fatality without substantial aircraft damage or serious injury and substantial aircraft damage

Class C Accidents. Total damage is between $20,000 and $199,000, nonfatal injury or illness causes loss of work time, or disability at any time

Golden Hour. First hour after an injury occurred; conceptual interval of time in which a trauma patient requires life saving interventions to prevent or reduce mortality

Launch Authority. Aviation commander considers the collective risk assessment of the mission and determines final mission execution authority or launch authority. The operational aspects related to the collective risk assessment include but are not limited to threat, rules of engagement, weather, fighter management, escort requirements, and overall tactical situation

Level I Trauma Center. Provides comprehensive trauma care, serves as a regional resource, and provides leadership in education, research, and system planning; required to have immediate availability of trauma surgeons, anesthesiologists, physician specialists, nurses, and resuscitation equipment; required to treat 1200 admissions a year or 240 major trauma patients per year or an average of 35 major trauma patients per surgeon; similar to the military's Role 4 Medical Centers

Level II Trauma Center. Provides comprehensive trauma care either as a supplement to a level I trauma center in a large urban area or as the lead hospital in a less population-dense area; must meet essentially the same criteria as level I but volume performance standards are not required and may depend on the geographic area served; not expected to provide leadership in teaching and research; similar to the military's Role 4 Medical Centers

Level III Trauma Center. Provides prompt assessment, resuscitation, emergency surgery, and stabilization with transfer to a level I or II as indicated; serves communities that do not have immediate access to a level I or II trauma center; Similar to the military's Role 2 Light Maneuver, Role 2 Enhanced, or Role 3 Combat Support Hospital in deployed environments or Community Hospitals in garrison

Level IV Trauma Center. Provides advanced trauma life support prior to patient transfer in remote areas in which no higher level of care is available; key role is to resuscitate and stabilize patients and arrange for their transfer to the closest, most appropriate trauma center level facility; similar to the military's Role 1 Aid Station in deployed environments or Health Clinics in garrison

Military Assistance to Safety and Traffic. Army aeromedical evacuation assistance to civilian authorities in cases of medical emergencies beyond the capability of the requesting civilian community; MAST

Medical Evacuation. Dedicated, standardized medical evacuation platforms (air or ground), with medical professionals who provide timely, efficient movement and en route care of the wounded, injured, or ill; MEDEVAC

Medical Regulating. Coordination and control of moving patients to medical treatment facilities that are best able to provide the required specialty care; this system is designed to ensure the efficient and safe movement of patients

Medical Treatment Facility (MTF) Enrollment Area. Time-based geographic concept of an area within 30 minutes' drive time of an MTF in which a commander may require TRICARE Prime beneficiaries to enroll with the MTF; replaced the distance-based catchment and PRISM area concepts

Mission Authority. Validation of a medical requirement, establishment of medical priorities, and recommendation of mission platform must be in the form of a 9-line MEDEVAC request. A medical officer approves the use of MEDEVAC aircraft for the mission based on medical necessity and asset availability

Pre-Hospital Emergency Medical Services. Includes pre-hospital triage, stabilization, treatment, and transport of sick and injured to a medical treatment facility for definitive medical care; Basic Life Support (BLS), Advanced Life Support (ALS), and pre-hospital ground and transportation to definitive medical care

PRISM Area. Military Health System geographic boundary or market area within a 20-mile Provider Requirement Integrated Specialty Model for outpatient care; includes stand-alone clinics or ambulatory care centers

Role 1 Medical Care. Provides immediate lifesaving measures, disease and non-battle injury prevention and care, combat and operational stress preventive measures, and patient location and acquisition; provides primary health care, specialized first aid, triage, resuscitation, and stabilization

Role 2 Medical Care. Expands Role 1 medical care and provides advanced trauma management and emergency medical treatment including continuation of resuscitation; includes capability to provide packed red blood cells, limited x-ray, laboratory, dental support, combat and operational stress control, preventive medicine, Role 2 veterinary medical and resuscitative surgical support, and limited patient hold

Role 3 Medical Care. Expands Role 2 medical care and provides care to all categories of patients, to include resuscitation, initial wound surgery, and post-operative treatment

Role 4 Medical Care. Most definitive medical care within the military health system found in CONUS-base hospitals

APPENDIX A

MILITARY MEDEVAC AIRCRAFT CAPABILITIES

The technical descriptions of the capabilities of the common Army aeromedical evacuation aircraft are listed below. These include the HH-60 Blackhawk and the UH-72 Lakota.

HH-60M MEDEVAC Blackhawk

Length	64 feet 10 inches(rotor turning)
Width	53 feet 8 inches (rotor turning)
Height	16 feet 10 inches (overall)
Weight	11,500 pounds
Propulsion	Two T700-GE-701Cs
Crew	Three
Speed	150 knots
Vertical Rate of Climb	185 FPM
Max Range	315 nm (internal fuel)

The HH-60M MEDEVAC helicopter provides significant enroute patient care enhancements. It incorporates a medical interior and an electric hoist, O2 generator, FLIR and an upgraded navigation package. The HH-60M provides a 6 patient litter system, on-board oxygen generation, and a medical suction system. It is simply the best in aeromedical evacuation. For military combatants. War victims. Civilians injured in natural disasters. It has a state-of-the-art medical interior that can accommodate a crew of three and up to six acute care patients. The HH-60M's leading-edge technology incorporates an improved environmental control system. Cardiac monitoring systems. Oxygen generation, distribution and suction systems. Airway management capability. Provision for stowing IV solutions. And an external electrical rescue hoist. And in addition to extensive immediate care, the HH-60M can perform all weather terrain battlefield evacuation, combat search and rescue, hospital ship lifeline missions, deep operations support, forward surgical team transport, medical logistics resupply, medical personnel movement, patient regulating, disaster/humanitarian relief, and MAST/HELP state support.
The HH-60M's medical interior can accommodate three to six acute care patients and their medical attendants. Ergonomic design has maximized the HH-60M cabin space, placing sophisticated, life-saving instruments and equipment at the fingertips of the medical attendants. A unique platform design allows the interior to transport either six litter or seven ambulatory systems, oxygen distribution and suction systems, airway management capability, and provisions for stowing intravenous solutions.

Figure 11. HH-60M MEDEVAC Blackhawk

Source: U.S. Army Combat Readiness/Safety Center Aviation Directorate, Manned Resources: Rotary Wing, 2013, https://safety.army.mil/LinkClick.aspx?fileticket=h3p1m-VME-w%3d&tabid=1574 (accessed 11 November 2013).

The MEDEVAC Blackhawk evacuates a maximum of six litter patients or four litter patients if the litter carousel is not installed, is rescue hoist capable, and is structured to accommodate a wide-range of medical equipment for enroute patient care procedures, such as airway management and cardiac monitoring. All active duty MTOE air ambulance companies employ the Blackhawk.

The UH-72 is designed to take on a range of missions, from general support and medical evacuation (MEDEVAC) to personnel recovery and counter-narcotics operations. They are planned to replace the UH-1 and OH-58A/C, which are older light utility helicopters, and supplant other types in domestic use, primarily those in Army National Guard service. The UH-72 is being procured as a commercial off-the-shelf (COTS) product, thereby greatly simplifying logistics support of the fleet.[9] EADS NA has teamed with Sikorsky to provide Contractor Logistics Support (CLS) for the UH-72, through its Helicopter Support, Inc. (HSI)/Sikorsky Support Services, Inc. (SSSI) subsidiaries.

UH-72 Lakota

Crew: 2 pilots
Capacity: 8 troops or 2 stretchers and medical crew
Length: 42 ft 7 in (13.03 m)
Rotor diameter: 36 ft 1 in (11.00 m)
Height: 11 ft 9 in (3.45 m)
Disc area: 1,023 ft² (94.98 m²)
Empty weight: 3,950 lb (1,792 kg)
Useful load: 3,953 lb (1,793 kg)
Max takeoff weight: 7,903 lb (3,585 kg)
Powerplant: 2× Turbomeca Arriel IE2 turboshafts, 738 shp (551 kW) each

Maximum speed: 145 knots (167 mph, 269 km/h)
Range: 370 nmi (426 mi, 685 km)
Service ceiling: 18,000 ft (5,791 m)

Figure 12. UH-72 Lakota

Source: U.S. Army Combat Readiness/Safety Center Aviation Directorate, Manned Resources: Rotary Wing, 2013, https://safety.army.mil/LinkClick.aspx?fileticket=h3p1m-VME-w%3d&tabid=1574 (accessed 11 November 2013).

The MEDEVAC Lakota evacuates a maximum of two litter patients, is rescue hoist capable, and is structured to accommodate medical equipment for lifesaving measures, such as airway management and cardiac monitoring. All active duty TDA air ambulance detachments employ the Lakota. As highlighted above, this aircraft is limited by weight restrictions; therefore, medical configuration of this aircraft is tailored by mission requirements.

Bell (model 205A-1) UH-1H (1965-1986) is identical to the UH-1D but is equipped with an upgraded engine that allows transport of up to 13 troops. The UH-1H has a two-bladed semi-rigid see-saw bonded all-metal main rotor and a two-bladed rigid delta hinge bonded all-metal tail rotor. The UH-1H is powered by a single Lycoming T53-L-13B 1400 shp turboshaft engine. More UH-1H *Hueys* were built than any other model. The UH-1H was licensed for co-production in the Republic of China (Taiwan) and in Turkey.

UH-1 Huey

Crew: 1-4
Capacity: 3,880 lb including 14 troops, or 6 stretchers, or equivalent cargo
Length: 57 ft 1 in (17.40 m) with rotors
Wingspan: 48 ft 0 in (14.63 m)
Width: 8 ft 7 in (2.62 m) (Fuselage)
Height: 14 ft 5 in (4.39 m)
Empty weight: 5,215 lb (2,365 kg)
Gross weight: 9,040 lb (4,100 kg)
Max takeoff weight: 9,500 lb (4,309 kg)
Powerplant: 1 × Lycoming T53-L-13 turboshaft, 1,400 shp (1000 kW)
Main rotor diameter: 48 ft 0 in (14.63 m)

Maximum speed: 135 mph (217 km/h; 117 kn)
Cruise speed: 125 mph (109 kn; 201 km/h)
Range: 315 mi (274 nmi; 507 km)
Service ceiling: 19,390 ft (5,910 m) (Dependent on environmental factors such as weight, outside temp., etc)
Rate of climb: 1,755 ft/min (8.92 m/s)

2x 7.62 mm M60 machine gun, or 2x 7.62 mm GAU-17/A machine gun
2x 7-round or 19-round 2.75 in (70 mm) rocket pods
2x 7.62 mm Rheinmetall MG3 (German Army and German Luftwaffe)

Figure 13. UH-1 Huey

Source: U.S. Army Combat Readiness/Safety Center Aviation Directorate, Manned Resources: Rotary Wing, 2013, https://safety.army.mil/LinkClick.aspx?fileticket=h3p1m-VME-w%3d&tabid=1574 (accessed 11 November 2013).

By the 2014 TDA, the U.S. Army Air Ambulance Detachment Fort Rucker, under the Aviation Center of Excellence, requires and is authorized eight UH-1V utility helicopters (USFMSA 2013). These are the same aircraft flown as Army MEDEVAC in Vietnam, but the Army incrementally, then completely, eliminated the aircraft from its inventory as of 2009. However, Bell Helicopter continues to produce MEDEVAC aircraft for commercial companies. The Fort Rucker Air Ambulance Detachment, also known as "Flatiron," in reality consists of eight LUH-72 Lakotas, analogous to the other three air ambulance detachments in the United States.

APPENDIX B

COMMERCIAL MEDEVAC AIRCRAFT CAPABILITIES

The technical descriptions of the capabilities of the common commercial aeromedical evacuation aircraft are listed below. These include the Bell Helicopter series and the American Eurocopter series.

WEIGHT		**SPEED**		**CAPACITIES**	
Maximum Gross Weight	4,150 lbs.	VNE (Maximum Air Speed)	130 kts.	Required Crew	1
Empty Weight	2,200 lbs.	ECON. Cruise (Efficiency)	109 kts.	Passengers	6
Useful Load	1,950 lbs.				
Useful Load with full fuel	1,213 lbs.	**RANGE**		**ROTOR BLADES**	
Maximum External Load	2,000 lbs.	Maximum Fuel Range	317 nm.	Main	2
		Endurance (No Reserves)	2.8 hrs.	Tail	2
PERFORMANCE					
Service Ceiling	20,000 ft.	**FUEL**			
Hover Ceiling, IGE	16,500 ft.	Fuel Capacity	110 gal.		
Hover Ceiling, OGE	5,400 ft.				
Installed Horsepower	650 hp.	**ENGINE**			
Takeoff Power	435 hp.	Manufacturer	Allison		
Max. Continuous Power	370 hp.	Model	250-C30P		

Figure 14. Bell Helicopter Series

Source: Evergreen International Aviation, Inc., Fleet Type III Helicopters, http://www.evergreenhelicopters.com/fleet.html; Air Methods, About Air Methods, 2013, http://www.airmethods.com/airmethods/about-us/about-air-methods#.UofQAide3-s (accessed 16 November 2013).

WEIGHT	
Maximum Gross Weight	5,512 lbs.
Empty Weight	2,561 lbs.
Useful Load	2,399 lbs.
PERFORMANCE	
Service Ceiling	20,000 ft.
Installed Horsepower	732 hp.
Takeoff Power	732 hp.
Max. Continuous Power	625 hp.
SPEED	
VNE (Maximum Air Speed)	152 kts.
FUEL	
Fuel Capacity	143 gal.
Fuel Capacity with Auxiliary	268 gal.
ENGINE	
Manufacturer	Turbomeca
Model	ARRIEL 1D1
CAPACITIES	
Required Crew	1
Passengers	5/6
ROTOR BLADES	
Main	3
Tail	2

Figure 15. American Eurocopter Series

Source: Evergreen International Aviation, Inc., Fleet Type III Helicopters, http://www.evergreenhelicopters.com/fleet.html; Air Methods, About Air Methods, 2013, http://www.airmethods.com/airmethods/about-us/about-air-methods#.UofQAide3-s (accessed 16 November 2013).

APPENDIX C

INSTALLATION MANAGEMENT COMMAND MONTHLY AIR/GROUND

MEDEVAC REPORT

IMCOM MONTHLY AIR / GROUND MEDEVAC REPORT							
REGION		NAME OF PERSON SUBMITTING REPORT					
INSTALLATION							
MONTH OF REPORT							
TODAY'S DATE							
PATIENT DATA							
# PATIENT(S) TRANSPORTED VIA FEE-FOR-SERVICE **AIRCRAFT**							
# PATIENT(S) TRANSPORTED VIA DEDICATED **AIRCRAFT**							
# PATIENT(S) TRANSPORTED VIA FEE-FOR SERVICE **GROUND AMBULANCE ****							
# PATIENT(S) TRANSPORTED VIA DEDICATED **GROUND AMBULANCE** **							
TOTAL # PATIENT TRANSPORTED VIA AIR AMBULANCE	CIVILIAN		MILITARY		Total Life Limb or Eyes		
TOTAL # PATIENT TRANSPORTED VIA GROUND AMBULANCE **	CIVILIAN		MILITARY		Total Life Limb or Eyes		
SORTIE DATA							
TOTAL # AIR EVACUATION SORTIES							
TOTAL # GROUND AMBULANCE SORTIES **							
# AIR MISSIONS CANCELLED AFTER LIFT OFF		REASON FOR CANCELLATION	N/A				
# EMERGENCY CRASH DRILLS PERFORMED							
# PATIENTS REFUSING AIR TRANSPORT		REASON	N/A				
# OF MAST SUPPORT MISSIONS							
COST DATA							
COST OF EACH FLIGHT		FEE CHARGED PER CRASH DRILL					
TOTAL COST OF FLIGHTS		TOTAL CHARGE FOR CRASH DRILLS					
COST OF EACH GROUND TRANSPORT **							
TOTAL COST OF GROUND TRANSPORTS **							
COST FOR DEDICATED A/C ON SELECTED HIGH-RISK TRAINING DAYS		NUMBER OF HIGH-RISK TRAINING DAYS					
TOTAL COST TO IMCOM							

	TYPE OF INJURY SUSTAINED BY PATIENT	PICKUP SITE / DROP OFF SITE
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

OTHER PERTINENT INFORMATION
1. Fort xxxx Range Control reports High Risk Training Events which normally occur on a daily basis, including many weekend days. The majority of these events are Live Fire Convoy Training, Fire and Movement, Aerial Gunnery, or live fire ranges with initial entry soldiers. I am reporting 23 days of High-Risk Training Days.   **2. An additional twelve soldiers were medically evacuated by the unit.**
OTHER PERTINENT INFORMATION
FORM COMPLETION INSTRUCTIONS
**DISREGARD BLOCK IF YOUR INSTALLATION DOES NOT HAVE AN IMCOM GROUND AMBULANCE CONTRACT
EACH GRAY BLOCK MUST HAVE AN ENTRY, e.g., "0" (ZERO) OR "N/A" (NO ENTRY REQUIRED IN "TYPE OF INJURY SUSTAINED BY PATIENT" IF "0" PATIENTS)
SPREADSHEET IS DUE BY THE 5TH OF EACH MONTH PROCEEDING REPORTED MONTH; DO NOT SEND DATA VIA EMBEDDED EMAIL OR WORD DOCUMENT
INJURY TYPE MUST BE EXPLICIT; ENTRIES SUCH AS "VEHICLE ROLLOVER", "SOLDIER FELL" OR "LEG INJURY" DO NOT EXPLAIN THE TYPE OF INJURY SUSTAINED
IF NECESSARY, USE CONTINUATION SHEET FOR TYPE OF INJURIES SUSTAINED (SEE "INJURY CONTINUED" TAB BELOW)
ANNOTATE MISSIONS CONDUCTED OFF THE INSTALLATION, i.e., MAST SUPPORT
DO NOT ALTER THE SPREADSHEET

Figure 16. IMCOM MEDEVAC Report, Front Page

Source: David McGowen, Fort Sill Range Control, 2013b. Email document to author, “IMCOM MEDEVAC Report.” 26 November.

IMCOM MONTHLY AIR / GROUND MEDEVAC REPORT CONTINUED		
	TYPE OF INJURY SUSTAINED BY PATIENT	PICKUP SITE / DROP OFF SITE
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
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38		
39		
40		
41		
42		
43		
44		
45		
OTHER PERTINENT INFORMATION		

Figure 17. IMCOM MEDEVAC Report, Back Page

Source: David McGowen, Fort Sill Range Control, 2013b. Email document to author, “IMCOM MEDEVAC Report.” 26 November.

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